SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 17
SEPTEMBER 1, 1976

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A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

INTERCONTINENTAL COMPARISON OF EVAPORATION ESTIMATES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-08800

ON THE COMPONENTS OF TIME SERIES; THE REMOVAL OF SPATIAL DEPENDENCE,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Applied Mathematics.
For primary bibliographic entry see Field 2B.
W76-08803

RATIONALE FOR A WATER POLLUTION CODE PART 1: THE WASTE SYSTEM AND THE NATURAL SYSTEM,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W76-08839

DESERT ECOSYSTEMS: HIGHER TROPHIC LEVELS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
I. Noy-Meir.
Annual Review of Ecology and Systematics, Vol. 5, p. 195-214, 1974. 1 fig, 114 ref.

Descriptors: *Xerophilic animals, *Soil microorganisms, *Trophic level, *Cycling nutrients, *Deserts, Vegetation effects, Mathematical models, *Ecosystems, Food webs, Soil erosion, Water balance, Droughts, Food habits, Arid lands.

This second part of this study (first part, see W74-13150) on desert ecosystems deals with the higher trophic levels of animals and decomposers, man in the desert system, feedbacks between different components and levels, and modelling of arid ecosystems. Desert ecosystems are in their own way at least as complex as most temperate systems. Major problems in desert ecology are related to one or more of the following features: the dominant influence of space-time distribution and water dynamics (sometimes in conjunction with heat and salt) on energy flows and species adaptations; discrete pulses of the major input and numerous biological activities; reserve forms and stages and the transfers between them and active pulses; random environmental variation and the special adaptation to uncertainty; impact of spatial heterogeneity on total energy, water and nutrient flows and on survival of many species; opportunistic feeding of animals, causing complex food webs; and different 'stabilities' of the ecosystem at distinct time scales and relative to different 'disturbances'. Various ecological simulation models relevant to desert ecosystems are described. (Jahns-Arizona)
W76-09064

THE NATURE AND CAUSES OF DESERTIZATION,
International Livestock Centre for Africa, Addis Ababa (Ethiopia).
For primary bibliographic entry see Field 4C.
W76-09069

A PRELIMINARY WATER AND ENERGY BUDGET ANALYSIS OF MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4B.
W76-09072

SIMULATION OF DEEP SEEPAGE TO A WATER TABLE,
Connell/Metcalf and Eddy, Coral Gables, Fla.
For primary bibliographic entry see Field 2F.
W76-09245

EVALUATION OF A MONTHLY WATER YIELD MODEL,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
C. T. Haan.
Transactions of the American Society of Agricultural Engineers, Vol 19, No 1, p 55-60, January-February 1976. 6 fig, 3 tab, 11 ref.

Descriptors: *Model studies, *Watersheds(Basins), *Runoff, Mathematical models, Precipitation(Atmospheric), Rainfall, Evapotranspiration, Seepage, Soil water, Streamflow, Hydrographs, Hydrology, *Water yield.

The results of evaluating the performance of a monthly water yield model on 46 watersheds located in Kentucky, North Carolina, South Carolina, Tennessee and Virginia were reported. In general, whenever the watershed being modeled met the assumptions under which the model was developed, the model performance was satisfactory. The assumptions included: (1) no runoff due to snow, (2) daily rainfall evenly distributed over the entire watershed, (3) short delays between rainfall and runoff, (4) stationary response characteristics between rainfall and runoff, and (5) record available for parameter estimation is representative of watershed behavior. (Sims-ISWS)
W76-09246

UNIT HYDROGRAPHS - A COMPARATIVE STUDY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09254

2B. Precipitation

ON THE COMPONENTS OF TIME SERIES; THE REMOVAL OF SPATIAL DEPENDENCE,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Applied Mathematics.
T. G. J. Dyer.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 431, p 157-165, January 1976. 4 fig, 4 tab, 12 ref.

Descriptors: *Stochastic processes, *Numerical analysis, *Statistical methods, *Precipitation(Atmospheric), Time series analysis, Temporal distribution, Correlation analysis, Variability, Frequency, Africa.
Identifiers: *Spectral analysis, *South Africa, Trend analysis, Eigenvalues, Spatial dependence, Annual precipitation, Linear models, Null hypothesis, Normality, Significance.

A linear model was fitted to the precipitation series of each group of stations formed by principal component analysis on 157 precipitation records (Dyer 1975). Precipitation was thus decomposed into independent components one each for regional temporal effect, regional spatial effect, and a residual or micro-effect. Each region has a temporal effect which was analyzed for trend, enabling the conclusion to be made that Southern Africa's precipitation budget is stationary. On the other hand, trend on a microscale is present over randomly distributed parts of the country. Spectral analysis showed the oscillatory behavior of the regional temporal effects, and provided information useful to the fitting of stochastic forecasting models to the data. The technique solves the problem of dependence between meteorological time series, and can be applied to any variable. (Jones-ISWS)
W76-08803

DEVELOPMENT OF A MATHEMATICAL MODEL OF INFILTRATION WHICH INCLUDES THE EFFECTS OF RAINDROP IMPACT,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2G.
W76-08844

FOG FORMATION AND FOG ELIMINATION,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
For primary bibliographic entry see Field 5G.
W76-08854

COOLING TOWER EXPERIENCE AND THE METEOROLOGICAL CONSEQUENCES OF THERMAL DISCHARGES FROM NUCLEAR POWER PLANTS IN THE FEDERAL REPUBLIC OF GERMANY,
Deutscher Wetterdienst, Offenbach am Main (West Germany).
For primary bibliographic entry see Field 5G.
W76-08855

MOUNTAINOUS WINTER PRECIPITATION: A STOCHASTIC EVENT-BASED APPROACH,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
L. Duckstein, M. Fogel, and D. Davis.
In: National Symposium on Precipitation Analysis for Hydrologic Modeling, June, 1975, Davis, California, 18 p. 15 fig, 16 ref. OWRT B-032-ARIZ(17)

Descriptors: *Stochastic processes, *Precipitation(Atmospheric), *Model studies, *Winter, *Mountains, Probability, Systems analysis, Synthetic hydrology, Analytical techniques, Time series analysis, Frequency analysis, Weather data.
Identifiers: Poisson process.

The purpose is to provide decision makers with a stochastic model of winter precipitation that relies on the analysis of a minimal amount of readily available data and which can incorporate the effects of mountainous terrain on precipitation. Two probabilistic precipitation models are considered. The first assumes that the arrival of winter storms is a Poisson process, implying that the number of events in any time interval is independent of the number in any other interval. A second model is developed which employs a mixed distribution to describe the number of events in an interval of time, using the assumption that there is some persistence in the weather and that the occurrence of a particular event or sequence of events is somewhat dependent on past events. Both models possess considerable flexibility (one may choose the level of complexity matching the data and problem at hand). The second model, based on both prior observation and experimental evidence, does not seem to be substantially better than the simpler first model. The strength of the models is such that an asymptotic normal process is reached after one season only (150 days) which leads to a simplified approximate generation scheme. Internal consistency checks of the model tend to confirm that the assumptions may be reasonable and that data should be gathered along event-based lines rather than equispaced intervals. (Robinett-Arizona)
W76-09062

DESERT ECOSYSTEMS: HIGHER TROPHIC LEVELS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 2A.
W76-09064

COMPARATIVE EVALUATION OF YEARLY CLIMATIC FACTORS WITH THE FIVE YEARS AVERAGES FOR FUDHALIYA AGRO-METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
G. F. Kaka, and M. S. Kettaneh.
Technical Report 2, March, 1975. 31 p. 7 fig. 9 tab.

Descriptors: *Agroclimatology, *Meteorological data, *Average, *Variability, Climatic data, Data collections, Climatology, Environment, Agriculture, Precipitation(Atmospheric), Evaporation, Measurement, Soil temperature, Humidity, Cloud cover, Solar radiation, Wind velocity, Frost.
Identifiers: *Fudhaliya Agro-meteorological Station(Iraq), Climatic extremes.

Variations of all climatic factors recorded at the Fudhaliya Agro-meteorological station, located near Baghdad, Iraq, are discussed for the period 1969 to 1973. Deviations of these climatic factors from the five year average together with their extremes are instrumental in obtaining a better insight into agricultural yield, irrigation needs, growth of forests, incidence of pests, diseases of plants, and other related factors. Important climatic factors studied include air temperature, ground frost, soil temperature, relative humidity, rainfall, evaporation, wind speed, cloud cover, sunshine duration, and solar radiation. For all elements except relative humidity and wind speed, departures from their respective averages were least in the summer and greatest in the winter, tapering off slowly during autumn and spring (more slowly in spring). For relative humidity and wind speed the reverse was true. This information will aid scientists in other fields and the country's planners to gain insight into how weather affected the country's overall growth and yield, particularly agriculture and related branches. (Robinett-Arizona)
W76-09066

COMPARATIVE EVALUATION OF CLIMATIC FACTORS AND CONDITIONS AT FUDHALIYA AGRO-METEOROLOGICAL STATION AND BAGHDAD AIRPORT METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
G. F. Kaka.
Technical Report 1, September, 1974. 21 p, 7 fig, 7 tab.

Descriptors: *Meteorological data, *Precipitation(Atmospheric), *Evaporation, *Agroclimatology, *Measurement, Climatic data, Weather data, Humidity, Cloud cover, Solar radiation, Data collections, Microenvironment, Soil temperature, Instrumentation, Wind velocity.
Identifiers: *Fudhaliya Agro-meteorological Station(Iraq), Baghdad Airport Meteorological Station(Iraq).

Data collected from 1969-1972 at the Fudhaliya agro-meteorological station are compared with data collected at the Baghdad airport meteorological station situated about 40 km from Fudhaliya and having similar topographical features. These data include air temperature, soil temperature, relative humidity, rainfall, evaporation, wind speed and direction, cloud cover, sunshine duration, and solar radiation. Little discrepancy in the measurement of these factors by the two stations was found. Part of the differences that were found can be explained by environmental influences such as the presence of trees close to the station, irrigation experiments, differences in soil and vegetation, and other related factors. Other differences could originate from lack of proper maintenance of instruments and inexperience of workers at Fudhaliya. (Robinett-Arizona)
W76-09067

THE NATURE AND CAUSES OF DESERTIZATION,
International Livestock Centre for Africa, Addis Ababa (Ethiopia).
For primary bibliographic entry see Field 4C.
W76-09069

THE SAHEL: TIME FOR A NEW APPROACH,
For primary bibliographic entry see Field 4C.
W76-09070

RAINFALL TRENDS IN THE WEST AFRICAN SAHEL,
Reading Univ. (England). Dept. of Geophysics; and Reading Univ. (England). Dept. of Agricultural Botany.
A. H. Bunting, M. D. Dennett, J. Elston, and J. R. Milford.
Quarterly Journal of the Royal Meteorological Society, Vol. 102, No. 431, p 59-64, January 1976. 3 fig, 3 tab, 15 ref.

Descriptors: *Droughts, *Correlation analysis, *Statistical methods, *Africa, Wet seasons, Forecasting, Precipitation(Atmospheric), Frequency, Rainfall.
Identifiers: *Rainfall trends, *West African Sahel, Addis Ababa(Ethiopia), Periodicity, Intertropical convergence zone, Coefficient of variation, Spectral analysis.

A statistical analysis has been made of long-term rainfall records from West Africa. No established trends or periodicities can be detected, and the recent succession of drought years falls within statistical expectation. Sahelian rainfall is not clearly linked to the frequency of westerly weather over Britain. (Jones - ISWS)
W76-09269

A RAPID METHOD OF ESTIMATING MEAN AREAL RAINFALL,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh.
Water Resources Bulletin, Vol. 12, No. 2, p 307-315, April 1976. 4 fig, 4 tab, 6 ref.

Descriptors: *Rainfall, *Linear programming, Hydrologic equation, Hydrology, Computers, Hydrologic aspects, Altitude, Average, Estimating.
Identifiers: *Rainfall estimation, *Mean areal rainfall, Trend surface analysis, Linear surface, Computer technology, Linear functions, Weight coefficients, Reciprocal distance squared method, Altitudinal effects.

A special case of generalized trend surface analysis was examined, which included a linear surface. It was shown that for most hydrologic problems this case determined mean area rainfall sufficiently accurately. Based on this conclusion, equations for rapid computation of mean areal rainfall were derived for this linear case. Results of the linear case were compared with other traditional methods of estimating mean areal rainfall. For most hydrologic studies a linear surface was sufficiently accurate. More complex functions had no particular advantage over the linear functions; rather they suffered from traditional numerical problems. For rapid computation of mean areal rainfall, the linear surface or the simple arithmetic mean was used. For complex physiographic regions, either the altitudinal effects in the computation or comparison with the isohyetal method had to be included. (Roberts - ISWS)
W76-09368

2C. Snow, Ice, and Frost

ZONATION OF SNOW CONDITIONS IN FOREST-TUNDRA, HUDSON BAY, NEW QUEBEC, (IN FRENCH),
Laval Univ., Quebec. Centre d'Etudes Nordiques.
S. Payette, J. Ouzilleau, and L. Filion.
Can J Bot. 53(10), p 1021-1030, 1975.

Descriptors: *Canada, *Snow management, Bays, *Tundra, *Forest management.
Identifiers: *Hudson Bay, Krummholz formations, New Quebec, Picea-Glauca, Picea-Mariana, Taiga, Zonation(Snow conditions).

Data on snow depth and snow density of various forest-tundra coniferous stands are presented. A latitudinal pattern in snow conditions is observed in the forest-tundra environment. This phytogeographical region is subdivided into a foresied subzone in the southern part and a shrub subzone (or krummholz) in the northern part and into a maritime ecoclimatic area near Hudson Bay (Canada) and a continental ecoclimatic area inland. The most snowy coniferous stands are located in the shrub subzone; snow density rises gradually from the taiga to the tundra. The highest values in snow properties are found in the maritime ecoclimatic area. Maximum snow depth measured in the northern part of the forest-tundra is explained by an increase of barren ground cover and by the presence of more open coniferous stands, which favor snow drifting and snow trapping. The gradual increase in snow density is related to more rigorous climatic conditions; wind exposure is rather important since these sites are getting more open. The differences in snow conditions between the ecoclimatic areas show that the maritime environment is more windy; the presence of scattered and erected white spruce (Picea glauca (Moench) Voss) in various krummholz formations in that area favors more efficient snow traps than those of krummholz formations located in the contintental area. The latter is dominated by prostrate and erect black spruce (P. mariana (Mill.) BSP.) always densely agglomerated. The latitudinal pattern in snow conditions reflects the climatic conditions of the forest-tundra, and this determines the specific ecological distribution of coniferous stands.--Copyright 1975, Biological Abstracts, Inc.
W76-08759

SELECTIVE FISH MORTALITY RESULTING FROM LOW WINTER OXYGEN,
For primary bibliographic entry see Field 5C.
W76-08788

SOLUTIONS FOR SOME PROBLEMS RESULTING FROM REFREEZING OF PERMAFROST AROUND A WELLBORE,
Atlantic Richfield Co., Plano, Tex. Production Research Center.
For primary bibliographic entry see Field 8G.
W76-08892

ENVIRONMENTAL AND INTRINSIC CONTROL OF FILTERING AND FEEDING RATES IN ARCTIC DAPHNIA,
State Univ. of New York at Albany. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-08933

PRIMARY PRODUCTION AND THE FACTORS CONTROLLING PHYTOPLANKTON GROWTH IN THE ANTARCTIC SEAS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08942

APPARATUS AND METHOD FOR MAKING SNOW WITH UNIFORM DROP SIZE,
Hedco, Inc., Paramus, N.J. (Assignee).
For primary bibliographic entry see Field 7B.
W76-09051

RESPONSES OF ARCTIC MARINE CRUSTACEANS TO CRUDE OIL AND OIL-TAINTED FOOD,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
For primary bibliographic entry see Field 5C.
W76-09123

OVERSNOW RUNOFF EVENTS AFFECT STREAMFLOW AND WATER QUALITY,
Wyoming Univ., Laramie.
D. L. Sturges.
In: Snow Management on Great Plains Symposium, July, 1975, Bismarck, North Dakota. Proceedings Great Plains Agricultural Council Publication No. 73, p 105-117. 6 fig, 2 ref, 3 tab.

Descriptors: *Snowmelt, *Surface runoff, *Streamflow, *Water quality, *Wyoming, Sediment load, Watersheds(Basins), Water sources, Rocky Mountain Region, Melt water, Flow rates.

Oversnow flow is the movement of snowmelt water across the snow surface and develops when a high snowmelt rate occurs early in the melt season. Well-developed oversnow runoff occurred in 2 of the 7 years of streamflow measurements on a big sagebrush watershed in southcentral Wyoming. Maximum flow rates in years with oversnow flow were 3-5 times greater than in years without the flow, while snowmelt runoff expressed as a percent of winter precipitation was four times as large. Suspended sediment concentrations were also much higher. (Witt-IPC)
W76-09274

2D. Evaporation and Transpiration

INTERCONTINENTAL COMPARISON OF EVAPORATION ESTIMATES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
R. D. Burman.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR1, Proceedings Paper 11958, p 109-118, March 1976. 3 fig, 6 tab, 18 ref, 2 append.

Descriptors: *Evaporation, *Air-water interfaces, *Hydrologic cycle, Irrigation, Water utilization, Water loss, Climatic data, Solar radiation, Wind velocity, Estimating, Evaporation pans, United States, Asia, Africa, Australia, Europe.
Identifiers: *Kohler method, *Oliver method, *Christiansen method, Class A pan.

The success of estimating pan evaporation by three methods was evaluated by comparing estimates with measured values for nine locations in the United States, Africa, Europe, and Australia. The locations represented coastal, inland, humid, equatorial, high latitude, and high elevation locations. The Christiansen, Kohler-Nordenson-Fox, and Oliver methods were evaluated. Pan evaporation estimates by the Kohler, et al method fit measurements best over a wide range of conditions. The Christiansen method provided excellent estimates under some conditions. The Oliver method estimated the poorest fit, but required the least input data. None of the three methods gave satisfactory estimates for all locations. (Roberts - ISWS)
W76-08800

COMPARATIVE EVALUATION OF CLIMATIC FACTORS AND CONDITIONS AT FUDHALIYA AGRO-METEOROLOGICAL STATION AND BAGHDAD AIRPORT METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09067

A PRELIMINARY WATER AND ENERGY BUDGET ANALYSIS OF MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4B.
W76-09072

SURFACE RESIDUE, WATER APPLICATION, AND SOIL TEXTURE EFFECTS ON WATER ACCUMULATION,
Agricultural Research Service, Bushland, Tex.; and Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 2G.
W76-09258

2E. Streamflow and Runoff

HYDROLOGIC UNIT MAP--1974, STATE OF MINNESOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09131

STATISTICS OF DATA TRANSFER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-09133

A TECHNIQUE FOR ESTIMATING THE TIME OF TRAVEL OF WATER IN INDIANA STREAMS,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 4A.
W76-09138

UNIT HYDROGRAPHS - A COMPARATIVE STUDY,
Illinois State Water Survey, Urbana.
K. P. Singh.
Water Resources Bulletin, Vol. 12, No. 2, p 381-392, April 1976. 2 fig, 2 tab, 4 ref.

Descriptors: *Unit hydrographs, Computers, *Linear programming, Hydrology, Least squares method, Storms, Rainfall, Mathematics, Runoff, Surface runoff, Effective precipitation, *Maryland, *Potomac River.
Identifiers: *Normal equations, North Branch Potomac River(Md), Subroutines, Absolute deviations, Surface runoff hydrographs, Inherent errors.

Unit hydrographs derived using two methods, linear programming and least squares, were compared. Test data comprised rainfall and runoff information from four storms over the North Branch Potomac River near Cumberland, Maryland. The mathematical bases of these methods for unit-hydrograph derivation were explained. The linear programming method minimized the sum of absolute deviations, and the least squares method minimized the sum of the squares of deviations. Computer subroutines were readily available for application of these methods. The unit hydrographs derived with the two methods were practically the same for two of the storms but differed somewhat for two other storms. However, the reconstituted direct surface runoff hydrographs were similar to those observed with the exception of the hydrograph for fourth storm which had a relatively more non-uniform rainfall excess of a considerably larger duration. (Roberts - ISWS)
W76-09254

OVERSNOW RUNOFF EVENTS AFFECT STREAMFLOW AND WATER QUALITY,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 2C.
W76-09274

THE PO RIVER AT THE ISLAND OF SERAFINI, (IN ITALIAN),
Milan Univ. (Italy). Laboratorio di Zoologia.
M. C. Ramusino, and B. Rossaro.
Ist Lombardo Accad Sci Lett Rend Sci Biol Med B. 108, p 89-128, 1974.

Descriptors: Europe, *Data collections, River flow, *Salts, Dissolved solids, Mollusks, Diptera, Water pollution, Crustanceans, Copepoda, Mayflies, Islands, Aquatic plants.
Identifiers: Hemiptera, Hirudinea, Mollusk, Oligochaetes, Serafini Island, Typha-Latifolia, *Italy(Po River).

Some physical-chemical and biological data referring to the Po River near the island of Serafini (province of Piacenza (Italy)), where an electronuclear center for the Commune of Caorso is in an advanced state of construction, are given. The area is probably not endangered by pollution. Variations in river flow affect the concentration of dissolved salts. The future discharge canal from the nuclear plant is at present a biological reservoir for the Po River. Among the abundant littoral vegetation, especially Typha latifolia, annelids (Oligochetes and Hirudinae), larvae of Ephemeroptera and Diptera, Hemiptera, Crustacea (Cladocera and Copepods) and mollusks predominate.--Copyright 1975, Biological Abstracts, Inc.
W76-09305

2F. Groundwater

TRANSFORM APPROACH TO SOLUTION OF GROUNDWATER FLOW EQUATIONS,
Nevada Univ., Las Vegas. Center for Water Resources Research.
C. M. Case, M. K. Peck, and C. L. Carnahan.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 955, $3.50 in paper copy, $2.25 in microfiche. Nevada Water Resources Center, Reno, Completion Report, May 1976. 17 p, 6 tab, 14 ref. OWRT A-059-NEV(2), 14-31-0001-5028.

Descriptors: Numerical analysis, Mathematical studies, *Groundwater movement, *Base flow, *Equations, Methodology, *Model studies, Aquifers, Fourier analysis, *Aquifer systems, Flow characteristics.
Identifiers: Flow equations, Diffusion-dispersion equations.

A method of obtaining approximate integral transforms of second-order partial differential equations with non-constant coefficients is discussed. The inverse of these transforms may be found using the appropriate standard inversion techniques. Finite and infinite Fourier transforms are discussed as particular cases. The application of these transforms to groundwater flow equations is discussed briefly via two examples. The potential advantages of this technique for aplication to numerical solution of flow equations and diffusion - dispersion equations are (1) for each independent variable that can be transformed, a dimension that would otherwise need to be considered numerically is eliminated, thus making larger problems accessible to computer analysis and (2) the solution can be generated at the spatial and temporal locations only, thus effecting further efficiencies in modeling a given aquifer system. (Fallon - Nevada)
W76-08922

HYDROGEOLOGICAL CONDITIONS OF AL-HAMAD AREA, IRAQ,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
H. A. Hassan, A. F. Eloubaidy, and F. E. El-Kike.
Technical Report 3, December, 1974. 18 p, 3 fig, 1 tab, 19 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Water storage, *Water chemistry, *Geohydrologic units, Groundwater, Water quality, Geologic formations, Geology, Climatology, Aquifers, Marine geology, Sedimentation, Groundwater recharge, Infiltration, Geologic history.
Identifiers: *Al-Hamad Plain(Iraq).

Al-Hamad plain is located to the north-northwest of the Northern Desert of Iraq, extending from Jordan, through Syria, Iraq, and Saudia Arabia. In Iraq, it covers an area of about 20,000 sq km. Information is presented on hydrological parameters, hydrogeological conditions, water type, water genesis, hydrochemical formation, and the paleohydrological conditions of the water bearing formations, using existing data on climatology, geology, and chemical composition of groundwater. Recharge to the aquifer is 1,375,000 cu m/year, and total storage is estimated at 13,800 million cu m. Groundwater characterized by chloride, sulfate, and bicarbonate waters. The chloride and sulfate water types are due to the MgC12 of marine genesis, while the bicarbonate originates from both the marine and the Na2S04 type of continental condition. These hydrochemical parameters indicate that sedimentation of the Cretaceous aquifer took place under a marine environment. Study of the Cretaceous aquifer took place under a marine environment. Study of the underground formation suggests that hydrochemical composition is probably due to dilution, mixing, and removal of original marine solution by infiltrating water when continental conditions prevailed over the area. (Robinett-Arizona)
W76-09068

A PRELIMINARY WATER AND ENERGY BUDGET ANALYSIS OF MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 4B.
W76-09072

THE EFFECTS OF GROUND-WATER DEVELOPMENT ON THE WATER SUPPLY IN THE POST HEADQUARTERS AREA, WHITE SANDS MISSILE RANGE, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W76-09137

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--CALIFORNIA REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-09139

HYDROLOGIC CONCEPTS OF ARTIFICIALLY RECHARGING THE FLORIDAN AQUIFER IN EASTERN ORANGE COUNTY, FLORIDA--A FEASIBILITY STUDY,
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 4B.
W76-09150

SIMULATION OF DEEP SEEPAGE TO A WATER TABLE,
Connell/Metcalf and Eddy, Coral Gables, Fla.
T. G. King, and J. R. Lambert.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 50-60, January-February 1976. 8 fig, 12 ref.

Descriptors: *Model studies, *Seepage, *Water table, *Deep percolation, Soil water, Soil moisture, Percolation, Groundwater, Root zone, Water table aquifers, Evapotranspiration, Precipitation(Atmospheric), Rainfall, Hydraulic conductivity, Hydrology, Groundwater movement.

A dynamic simulation model has been developed to trace the movement of precipitation to the water table. One submodel uses measured precipitation to simulate the amount and distribution of water leaving the root zone. A second submodel describes the subsequent movement of this water until it reaches the phreatic surface. The model has been used to simulate conditions on a Piedmont watershed with a water table at approximately 20 m depth. The results presented include computed evapotranspiration, moisture profiles for the unsaturated region, and water table movement as compared to observed data. (Sims-ISWS)
W76-09245

DETERMINATION OF THE HYDRAULIC CONDUCTIVITY - DRAINABLE POROSITY RATIO FROM WATER TABLE MEASUREMENTS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 73-84, January-February 1976. 13 fig, 25 ref.

Descriptors: *Hydraulic conductivity, *Porosity, *Specific yield, *Water table, Drawdown, Drainage systems, Groundwater movement, Drains, Dupuit-Forchheimer theory, Equations, Numerical analysis, Computers, Measurement, Graphical analysis, Heterogeneity, Anisotropy, Evapotranspiration, Saturated flow.
Identifiers: *K/f ratio, *Parallel drains, Drain spacing, Errors.

A method was presented for determining field effective values of the hydraulic conductivity-drainable porosity (K/f) ratio from water table measurements. Solutions were presented in graphical form for parallel drains and for a single drain in a semi-infinite medium. K/f can be determined from these solutions from either water table drawdown or rise measurements. Solutions were also presented for simultaneous drainage and vertical losses and may be used to evaluate the effect of evapotranspiration or deep seepage on K/f determinations. Errors due to unaccounted vertical losses can be minimized by making water table measurements close to the drain. (Visocky-ISWS)
W76-09249

A FINITE ELEMENT MODEL OF CONTAMINANT MOVEMENT IN GROUNDWATER,
Chile Univ., Santiago, Centro de Recursos Hidraulicos.
For primary bibliographic entry see Field 5B.
W76-09253

DETERMINING THE HYDRAULIC CONDUCTIVITY OF SOIL CORES BY CENTRIFUGATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 2G.
W76-09256

HYDROLOGICAL PROBLEMS ASSOCIATED WITH DEVELOPING GEOTHERMAL ENERGY SYSTEMS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09260

THE ROLE OF GROUND WATER.
Ground Water Age, Vol. 10, No. 5, p. 18-22, 26, January, 1976. 2 fig.

Descriptors: *Water management(Applied), *Hydrologic cycle, *Hydrologic equation, Aquifer characteristics, Groundwater movement, Hydraulic models.
Identifiers: *Groundwater management, *Aquifer stress, Hydraulic stress, Thermal stress, Chemical stress, Alluvial aquifers, Consolidated rock aquifers.

Ground water represents a relatively underdeveloped resource that can help meet future water requirements of the United States. A definite relationship exists between ground water and environmental stresses. Environmental stresses are categorized as hydraulic, thermal and chemical. Response to stress is in accordance with the laws of conservation of energy and mass. In the case of hydraulic stress, this would be represented as: inflow - outflow = change in storage. Similar equations could be used to express thermal and chemical stress situations. Ground water response takes the following rational: (1) the flow system reacts to each stress in accordance with the laws of conservation of mass and energy; (2) any given stress or combination of stresses on a flow system may result in a trifold response--hydraulic, thermal and chemical; (3) the system response is uniquely dependent upon the geometry and physical/chemical characteristics of the system. The stress-response mechanism is described in three general types of ground water systems: (1) alluvial aquifers associated with perennial streams, (2) sand and gravel aquifers including coastal plains, high plains and western valley aquifers, (3) consolidated rock aquifers of which sandstone, limestone and basalt are the most important. (Heiss-NWWA)
W76-09353

2G. Water In Soils

A SIMULATION MODEL OF BIOPHYSIOCHEMICAL TRANSFORMATIONS OF NITROGEN IN TILE-DRAINED CORN BELT SOIL,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 5B.
W76-08761

IMPROVED PROCEDURE FOR ION EXCHANGE EXPERIMENTS WITH SOILS USING LEACHING TUBES, AND HANDLING OF WATER REPELLENT SOILS, (IN GERMAN),
B. Beyme.
Z Pflanzenernaehr Bodenkd. 133(1/2), p 41-45, 1972.

Descriptors: *Soil analysis, *Analytical techniques, Model studies, *Ion exchange.
Identifiers: Leaching, tubes.

By means of a separatory funnel held in position by a rubber stopper, which closes the leaching tube air-tight, and a specially prepared rubber tubing put at the end of the stem, leaching of the soil may be improved. Water repellency of some soils may be overcome by evacuating. Wetting occurs when the stopcock is opened during evacuation.--Copyright 1974, Biological Abstracts, Inc.
W76-08762

POTENTIALLY BENEFICIAL USES OF SULFURIC ACID IN SOUTHWESTERN AGRICULTURE,
Arizona Univ. Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3F.
W76-08766

THE RELATIONSHIP BETWEEN HEAT CONDUCTANCE AND THE MOISTURE CONTENT OF THE SOIL, (IN DUTCH),
R. Hartmann, H. Verplancke, and M. De Boodt.
Meded Fac Landbouwwet Rijksuniv Gent. 37(4), p 1249-1260, 1972.

Descriptors: *Soil properties, *Measurement, *Analytical techniques, Soil analysis, Moisture content, Soil moisture, Heat transfer, Thermal conductivity.

An indirect method for the measurement of the soil moisture content, based on the soil thermal properties, is discussed. Use is made of a non-stationary heat flow to determine the thermal conductivity of a soil which is a function of the moisture content and a number of other soil parameters. The latter can be kept constant for a given soil. After calibration of the copper-constantan thermocouple, the relation between the thermal conductivity and the water content in a loamy sand was established. There is a pronounced influence of the spatial arrangement, the soil structure, of the soil particles. The thermal conductivity occurs mainly along the contact points.--Copyright 1974, Biological Abstracts, Inc.
W76-08769

WATER RETENTION BY CORE AND SIEVED SOIL SAMPLES,
Agricultural Research Service, Bushland, Tex.
P. W. Unger.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1197-1200, November-December 1975. 2 fig, 2 tab, 13 ref.

Descriptors: *Soil water, *Soil moisture, Moisture availability, Moisture content, Retention, Soil properties, Soil texture, Soil management, Water storage, Storage capacity, Cultivation, Sampling.
Identifiers: Sieved soil.

Mechanical analyses and water retention by core and sieved soil at -1/3 and -15 bar matric potentials were determined for samples from 26 sites ranging in texture from sand to clay. Objectives were to obtain a basis for identifying which soils may be influenced by deep tillage and profile modification with respect to water storage capacity and to determine the magnitude of errors possible when using sieved soils to establish field soil water contents. At -1/3 bar potential, cores retained more water than sieved soil when the water content was below 11%. The opposite occurred at higher water contents. At -15 bars potential, cores contained about 1 percentage point more water than sieved soils throughout the water content range encountered. These results showed that treatments which thoroughly disrupt the natural soil structure may decrease and increase the storage capacity of coarse- and fine-textured soils, respectively. When expressed as a percent of the core water content, differences between core and sieved soil contents at -1/3 bar potential ranged from -40 to +25% at 5 and 40% core water contents, respectively. At -15 bars potential, the range was from -52 to -4% at 5 and 25% core water contents, respectively. These differences indicate caution should be used when using sieved soils to infer water retention by field soils, regardless of texture. (Gibb-ISWS)
W76-08802

DEVELOPMENT OF A MATHEMATICAL MODEL OF INFILTRATION WHICH INCLUDES THE EFFECTS OF RAINDROP IMPACT,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff, and D. Evans.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 773 $4.00 in paper copy, $2.25 in microfiche. Completion Report, (1975). 25 p, 12 fig, 6 tab, 10 ref. OWRT A-027-ARIZ(2), 14-31-0001-3503.

Descriptors: *Infiltration, *Gamma rays, *Compaction, *Rainfall simulators, *Mathematical models, Watersheds(Basins), Soil types, Soil profiles, Hydraulic conductivity, Model studies, Soil compaction.
Identifiers: *Raindrop impact.

The purpose was to use an existing mathematical model of infiltration to assist in determining which factors, including raindrop impaction, were responsible for infiltration characteristics of a bare semi-arid watershed. The infiltration model developed by Roger Smith (1970) was selected as best suited for this investigation. Several laboratory and field rainfall simulator runs were modeled. Good correlation was found between the modeled and experimental results for both the infiltration data and the saturation profiles, for both bare and grass covered plots. For the lab and field experiments a realistic rotating disk rainfall simulator was used. In the field bare and grass covered plots were tested. In the lab specially constructed soil boxes were used that permitted measurement of infiltration and saturation profiles with time. Gross changes in saturated hydraulic conductivities due to crusting effects were also measured. Gamma ray attenuation techniques were used to obtain density and soil moisture profiles for the laboratory experiments. It was found that the Smith model can be used to simulate infiltration from different surface conditions as long as there is some method to calibrate the model. Carefully obtained saturated and unsaturated hydraulic properties for the soil types present in the watershed are needed in addition to infiltration data from a realistic rainfall simulator or through hydrograph analysis from unit subwatersheds.
W76-08844

THE EFFECT OF CERTAIN SYNTHETIC MACROMOLECULAR SUBSTANCES ON THE PHYSICO-CHEMICAL PROPERTIES OF SOIL AND ON THE FERTILIZER UTILIZATION COEFFICIENT, (IN FRENCH),
Academia de Stiinte Agricole si Silvice, Bucharest (Rumania).
A. Dorneanu, S. Andrei, M. Dobre, M. Handra, and R. Lacatusu.
Bull Acad Sci Agric For. 1, p 111-129, 1972.

Descriptors: *Soil amendments, *Soil physical properties, Fertilizers, Nutrients.
Identifiers: *Acrylamide, *Polyacrylamides.

Polyacrylamide in amounts of 150-200 kg/ha improves soil macro- and microstructure and its water permeability, increases the resistance of soil to settling and its ion exchange capacity, increases the amount of hydrolyzable N and the availability of soluble P and N, and improves the fertilizer utilization. Since the polymer is water-soluble it can be applied by spraying with standard spraying equipment. Polyacrylamide application to soil is recommended where improvement of soil physicochemical properties is indicated.--Copyright 1974, Biological Abstracts, Inc.
W76-08981

SOME COMMENTS ON INTERFERENCES BY CU(II) IONS AND AG(I) IONS ON THE WET REDUCTION-FLAMELESS ATOMIC ABSORPTION DETERMINATION OF MERCURY,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 5A.
W76-09039

PLANT COLLECTION FOR SALTLAND REVEGETATION AND SOIL CONSERVATION,
Western Australia Dept. of Agriculture, South Perth. Soils Div.
For primary bibliographic entry see Field 2I.
W76-09071

EFFECT OF THE MOZHAYSK RESERVOIR ON SOIL OF THE BANK AREA OF THE SURROUNDING TERRITORY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
V. E. Korenevskaya, L. B. Borovinskaya, and L. V. Komissarova.
Vestn Mosk Univ Ser 6 Biol Pochvoved. 29(4), p 101-107, 1974.

Descriptors: *Reservoirs, *Podzols, Soil properties, Soil moisture, Clays, *Seepage, *Banks, *Embankments.
Identifiers: Gley, *USSR(Mozhaysk reservoir).

During a 12-yr period seepage from the Mozhaisk reservoir (USSR) changed the derno-podzolic soils of bank area into derno-podzolic-gley and derno-podzolic gleyic soils, as characterized by their specific water regime and physico-chemical features.--Copyright 1975, Biological Abstracts, Inc.
W76-09081

CONDITIONS FOR USING A TENSIONPLATE AS A LYSIMETER, (IN GERMAN),
Agricultural Univ., Wageningen (Netherlands). Lab. of Agricultural Chemistry.
F. F. R. Koenigs.
Z Pflanzenernaehr Bodenk. 133(1/2), p 1-4, 1972.

Descriptors: *Lysimeters, *Moisture meters, Instrumentation, *Tensiometers, *Soil water movement.

With downward flow the tensionplate will function as a lysimeter when the soil water tension immediately above the plate will be equal to that beside the plate at the same level. With upward flow water tension immediately below the plate should not be altered by the plate. Flow from and to the soil below (downward flow) or above (upward flow) the plate should be prevented.--Copyright 1974, Biologicaal Abstracts, Inc.
W76-09082

NITROGEN AND PHOSPHORUS LEVELS IN SOILS BENEATH SEWAGE DISPOSAL PONDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-09197

SIMULATION OF DEEP SEEPAGE TO A WATER TABLE,
Connell/Metcalf and Eddy, Coral Gables, Fla.
For primary bibliographic entry see Field 2F.
W76-09245

VERTICAL FLOW OF AIR AND WATER WITH A FLUX BOUNDARY CONDITION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
D. B. McWhorter.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 2, p 259-265, March-April 1976. 3 fig, 1 tab, 7 ref.

Descriptors: *Soil water movement, *Air-water interfaces, *Infiltration, Air, Viscosity, Compressibility, Equations, Darcys law, Permeability, Saturation, Density, Pore pressure, Atmospheric pressure, Water pressure, Hydraulic conductivity, Porosity, Boundaries(Surfaces), Soil properties, Continuity equation, Ponding, Approximation method, Graphical methods.
Identifiers: *Air flow, Relative permeability, Incompressible flow, Richards equation.

The effects of viscous resistance to air flow on the downward movement of infiltrating water in soil were analyzed. A conceptual model was used in which air was replaced by a hypothetical incompressible fluid with a viscosity equal to that of air.

An equation analogous to Darcy's law was derived which incorporated resistance to flow of both air and water. The flow equation was later transformed to a dimensionless form. An important assumption used in deriving the equation was that the volume flux of the air is everywhere equal to and opposite in direction to that of water. An approximate solution was obtained using Parlange's technique of successive approximation, and the range of applicability for the solution was determined graphically. Numerical examples were presented which indicated that resistance to flow of an incompressible fluid with a viscosity equal to that of air would significantly influence both ponding time and the maximum infiltration rate short of ponding. Apparently the actual time-to-ponding must be between the two extremes predicted by single-phase and two-phase incompressible flow theory. (Visocky - ISWS)
W76-09251

HYDRAULIC PROPERTIES OF A POROUS MEDIUM: MEASUREMENT AND EMPIRICAL REPRESENTATION,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
R. W. Gillham, A. Klute, and D. F. Heermann.
Soil Science Society of America Journal, Vol. 40, No. 2, p 203-207, March-April 1976. 6 fig, 3 tab, 16 ref.

Descriptors: *Hydraulic properties, *Soil water, *Hysteresis, Laboratory tests, Soil moisture, Moisture content, Soil water movement, Groundwater movement, Infiltration, Drainage, Evaporation, Soil moisture meters, Hydrostatic pressure, Pressure head, Wetting, Drying, Soils, *Porous media.
Identifiers: Water retention.

The hysteretic water content-pressure head relationship and the hydraulic conductivity-water content relationship for a porous material are needed in the solution of the water flow equation to predict behavior of a given flow system. These hydraulic properties were measured in an unsteady-state manner using gamma ray attentuation for the water content and strain gage pressure transducer tensiometry for the pressure head. Envelope curves and four to six primary wetting and drying scanning curves of the water content-pressure relationship were determined. A convenient method of representation of the scanning curves by an empirical function was developed for use in computer solutions of the water flow equation. (Sims - ISWS)
W76-09255

DETERMINING THE HYDRAULIC CONDUCTIVITY OF SOIL CORES BY CENTRIFUGATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
M. H. Alemi, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Journal, Vol. 40, No. 2, p 212-218, March-April 1976. 5 fig, 2 tab, 15 ref, 1 append.

Descriptors: *Hydraulic conductivity, *Soils, *Centrifugation, *Infiltration, Laboratory tests, Groundwater movement, Permeability, Diffusivity, Conductivity, Hydrologic properties, Soil water, Soil moisture, Moisture content, Soil properties.
Identifiers: Centrifuges.

Two centrifugal techniques were proposed for determining the hydraulic conductivity of cores of natural soil. Experimental results were presented for one technique in which the change in weight of one end of the sample, previously centrifuged, was measured with a balance. The mathematical equations describing this redistribution process were developed and fitted to the data to ascertain the soil water diffusivity D. The value of the hydraulic conductivity K was obtained from K = bD, where b is also calculated. Calculated values of K agreed with previously published values. The second technique for which a theory was presented but no experimental values were provided depends upon the measurement of the volumetric outflow of water from a soil core when the speed of centrifugation is suddenly increased. (Sims - ISWS)
W76-09256

VARIABILITY OF HYDRAULIC CONDUCTIVITY IN TWO SUBSURFACE HORIZONS OF TWO SILT LOAM SOILS,
Wisconsin Univ., Madison. Dept. of Soil Science.
F. G. Baker, and J. Bouma.
Soil Science Society of America Journal, Vol. 40, No. 2, p 219-222, March-April 1976. 3 fig, 10 ref. EPA R802874.

Descriptors: *Hydraulic conductivity, *Soils, *Soil properties, *Variability, Loam, Loess, Silts, Subsoil, Soil horizons, Soil investigations, Infiltration, Groundwater, Groundwater potential, Soil moisture, Soil water movement, Soil science.
Identifiers: Crust tests, Soil variability.

Hydraulic conductivity was measured in the B22t and B31t horizons of 12 pedons of two soils developed in loess deposits overlying glacial till. Conductivity measurements were made with the crust test technique for unsaturated conditions and with a new related in situ method for saturated conditions. Nonlinear regression yielded simple well-fitting curves. Variability within and between major horizons in these soil series was found to be relatively low. The four horizons in these two silt loam soils had statistically identical hydraulic conductivity characteristics, even though morphological soil structure and soil genesis differed significantly. (Sims - ISWS)
W76-09257

SURFACE RESIDUE, WATER APPLICATION, AND SOIL TEXTURE EFFECTS ON WATER ACCUMULATION,
Agricultural Research Service, Bushland, Tex.; and Southwestern Great Plains Research Center, Bushland, Tex.
P. W. Unger.
Soil Science Society of America Journal, Vol. 40, No. 2, p 298-300, March-April 1976. 2 fig, 14 ref.

Descriptors: *Soil water, *Farm management, *Water storage, *Great Plains, *Organic matter, Mulching, Soils, Loam, Clay loam, *Evaporation, Precipitation(Atmospheric), Irrigation, Crops, Wheat, Soil properties, Soil science.
Identifiers: *Surface residue, Residue management.

Surface residue rates and water application amounts affect evaporation from soil. These factors were evaluated for their effects on water accumulation in a clay loam and a fine sandy loam soil. Surface residue rates ranged from 0 to 12,000 kg/ha and water was added at 0.25, 0.5, 1.0, or 2.0 cm/addition. At low residue rates and water applications, little or no water accumulated in the soils. The amount of water that accumulated in the soils increased as surface residue rates and water applications increased. Results for the two soils were remarkably similar, apparently because the liquid and vapor flow characteristics for the two soils were similar at high water contents, even though their water retention characteristics differed markedly. The results of this laboratory study were discussed with regard to residue management practices for low (dryland) and high (irrigated) residue production systems of the Great Plains. (Sims - ISWS)
W76-09258

DRAINAGE SYSTEM EFFECTS ON PHYSICAL PROPERTIES OF A LAKEBED CLAY SOIL,
Ohio State Univ., Columbus. Dept. of Agronomy.
S.S. Hundal, G. O. Schwab, and G. S. Taylor.
Soil Science Society of America Journal, Vol. 40, No. 2, p 300-305, March-April 1976. 7 fig, 1 tab, 11 ref.

Descriptors: *Drainage effects, *Crop response, *Soil properties, Drainage, Drainage practices, Soils, Soil physical properties, Soil strength, Compressive strength, Soil texture, Pores, Porosity, Land management, Surface drainage, Subsurface drainage, Hydraulic conductivity, Agriculture.
Identifiers: Crust density, Soil surface penetration.

The long-term effects of drainage on physical properties of a lakebed silty clay soil were evaluated 16 years after initiation of a field experiment. The treatments were undrained, surface drainage, subsurface drainage, and a combination of surface and subsurface drainage. Soil conditions were characterized by surface penetration resistance and by unconfined compressive strength, hydraulic conductivity, and pore size distribution in the 0-30 cm depth. Subsurface drainage resulted in greater soil hydraulic conductivity, less unconfined compressive strength, and less surface crust resistance than treatments without subsurface drainage. Subsurface drainage also decreased bulk density and increased the volume of air-filled pores at 0.02 to 1.0-bar suctions, but these effects were of smaller magnitude. An alfalfa-timothy mixture was grown during the period of these measurements. The survival of alfalfa and the total hay yield decreased in the order: combined surface and subsurface drained, subsurface drained, surface drained, and undrained treatments. (Sims - ISWS)
W76-09259

DETERMINING BOTH WATER CHARACTERISTICS AND HYDRAULIC CONDUCTIVITY OF A SOIL CORE AT HIGH WATER CONTENTS FROM A TRANSIENT FLOW EXPERIMENT,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
L. R. Ahuja, and S. A. El-Swaify.
Soil Science, Vol. 121, No. 4, p 198-204, April 1976. 6 fig, 1 tab, 7 ref.

Descriptors: *Hydraulic conductivity, *Soil properties, *Soil tests, Soil physical properties, Soil water, Soil water movement, Soil investigations, Laboratory tests, Soils, Clay loam, Wetting, Drying, Soil moisture, Moisture content, Porosity, Soil science.

A method of calculating both the water characteristics and hydraulic conductivity of a short soil core at high water contents from a single transient flow experiment was described and evaluated. The method was based on measurements of cumulative inflow or outflow of the water entering or leaving the core through a high-resistance porous plate on one end, and measurements of soil-water suction at theother end. The results indicated possibilities of good determinations in the soil-water region between 0-100 or 150 cm H2O suctions. Higher porous plate resistances gave better calculations over a wider range of water contnts than did the low resistances. The higher hydraulic conductivity values for an Inceptisol from Hawaii and the tendency of these values to decrease more sharply with decreases of water content than corresponding values fo Yolo soil were confirmed by this method. (Sims - ISWS)
W76-09271

SEWAGE EFFLUENT INFILTRATES FROZEN FOREST SOIL,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 5B.
W76-09288

2H. Lakes

THE EFFECTS OF INCREASING SALINITY ON THE PYRAMID LAKE FISHERY,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev.
For primary bibliographic entry see Field 5C.
W76-08753

THE EFFECTS OF WASTE WATER DIVERSION ON HEAVY METAL LEVELS IN THE SEDIMENTS OF A LARGE URBAN LAKE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-08754

THE EFFECT OF DURSBAN UPON FRESH WATER PHYTOPLANKTON,
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5C.
W76-08773

EFFECTS OF THERMAL CIRCULATION ON PHYTOPLANKTON PHOTOSYNTHESIS,
For primary bibliographic entry see Field 5C.
W76-08785

SELECTIVE FISH MORTALITY RESULTING FROM LOW WINTER OXYGEN,
For primary bibliographic entry see Field 5C.
W76-08788

FISH POPULATIONS IN A LARGE GROUP OF ACID-STRESSED LAKES,
For primary bibliographic entry see Field 5C.
W76-08790

ASSESSMENT AND ERADICATION OF HEAVY METAL POLLUTION IN A PLANNED URBAN ENVIRONMENT,
For primary bibliographic entry see Field 5C.
W76-08795

INFLUENCE OF MINERAL FERTILIZATION OF LAKES ON FISH GROWTH,
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
For primary bibliographic entry see Field 5C.
W76-08799

WIND-DRIVEN FLOW OF WATER INFLUENCED BY A CANOPY,
Texas A and M Univ., College Station. Dept. of Oceanography.
R. O. Reid, and R. E. Whitaker.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineering, Vol. 102, No. WW1, Proceedings Paper 11926, p 61-77, February 1976. 15 fig, 1 tab, 6 ref, 2 append. Army DACW72-71-C-0011.

Descriptors: *Model studies, *Winds, *Flow, *Flow, *Vegetation effects, Mathematical models, Numerical analysis, Vegetation, *Canopy, Drag, Storm surge, Wind pressure, Lakes, Estuaries, Fluid mechanics, Hydrodynamics.
Identifiers: *Wind-driven flow.

A time-dependent numerical model, which treats fully evolved wind-driven canopy flow as a coupled two-layer system, was developed. The interfacial stress was formulated in terms of a coupling coefficient and the flow differential. The resistance afforded by a vegetative canopy was parameterized in terms of a drag coefficient and dimensional properties of the canopy elements. With flow confined strictly to the canopy, the calming effect of the canopy was introduced through a sheltering coefficient. The canopy was modeled as a set of rigid uniform structures orientated normal to the flow and evenly distributed with specified density over the bottom. The algorithm was tested by simulating the steady-state water-surface profiles observed in a laboratory channel containing wire screen obstructions. The model was applied next to a wind-driven rectangular basin with simulated vegetation specified over half the bottom. (Sims-ISWS)
W76-08801

BIOMASS PARAMETERS AND PRIMARY PRODUCTION AT A NEARSHORE AND A MIDLAKE STATION OF LAKE ONTARIO DURING IFYGL,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-08825

OBSERVATIONS OF COLONIAL MULTIPLICATION IN A RAPIDLY GROWING ALGA, GONIUM MULTICOCCUM POCOCK (VOLVOCACEAE),
Hokkaido Univ., Muroran (Japan). Inst. of Algological Research.
For primary bibliographic entry see Field 5C.
W76-08826

SUMMER PHYTOPLANKTON PHOTOSYNTHESIS IN A NORTHEASTERN OHIO GLACIAL LAKE,
Akron Univ., Ohio. Dept of Biology.
For primary bibliographic entry see Field 5C.
W76-08828

A RESERVOIR COVE ECOSYSTEM MODEL,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-08830

EFFECTS OF INITIAL FLOODING ON FOREST VEGETATION AT TWO OKLAHOMA LAKES,
Oklahoma State Dept. of Agriculture, Oklahoma City.
For primary bibliographic entry see Field 4A.
W76-08831

ZOOPLANKTON OF WESTERN LAKE ERIE AT PUT-IN-BAY: A QUANTITATIVE STUDY, APRIL 1973-MARCH 1974,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
For primary bibliographic entry see Field 5C.
W76-08833

CHANGES IN THE ALGAL FLORA OF EAST HARBOR, OTTAWA COUNTY, OHIO, SINCE 1900,
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-08834

NUTRIENT-PRIMARY PRODUCTION RELATIONSHIPS IN CENTRAL LAKE ERIE: A SIMPLE CORRELATION APPROACH,
Canada Centre for Inland Waters, Burlinton (Ontario).
For primary bibliographic entry see Field 5C.
W76-08836

A MODEL FOR SALT DRIFT DEPOSITION FROM SPRAY PONDS,
Massachusetts Institute of Tech., Cambridge.
For primary bibliographic entry see Field 5B.
W76-08866

THERMAL DISCHARGE STUDIES ON THE GREAT LAKES-THE CANADIAN EXPERIENCE,
Ontario Hydro, Toronto.
For primary bibliographic entry see Field 5G.
W76-08869

ECOLOGY OF ARTIFICIALLY HEATED STREAMS, SWAMPS AND RESERVOIRS ON THE SAVANNAH RIVER PLANT, THE THERMAL STUDIES PROGRAM OF THE SAVANNAH RIVER ECOLOGY LABORATORY,
Savannah River Ecology Lab. Aiken, S. C.
For primary bibliographic entry see Field 5C.
W76-08870

THERMAL STUDIES ON TROPICAL MARINE ECOSYSTEMS IN PUERTO RICO,
Puerto Rico Nuclear Center, Rio Piedras. Radioecology Div.
For primary bibliographic entry see Field 5C.
W76-08872

BEHAVIOURAL RESPONSES OF LAKE MICHIGAN FISHES TO A NUCLEAR POWER PLANT DISCHARGE,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5C.
W76-08876

EFFECTS OF HEAT ENRICHMENT ON SPECIES SUCCESSION AND PRIMARY PRODUCTION IN FRESH-WATER PLANKTON,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs; and Atomic Energy of Canada Ltd., Chalk River (Ontario). Biology and Health Physics Div.
For primary bibliographic entry see Field 5C.
W76-08879

FIELD EVALUATION OF A PREDICTIVE MODEL FOR THERMAL STRATIFICATION IN LAKES AND RESERVOIRS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
J. M. Colonell.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 961, $7.75 in paper copy, $2.25 in microfiche. Water Resources Research Center, Amherst, Publication No. 60, Completion Report FY-76-7, January 1976. 204 p, 23 fig, 19 tab, 27 ref, 8 append. OWRT B-021-MASS(2). 14-31-0001-3595

Descriptors: *Reservoirs, *Lakes, Management, Evaluation, Evaporation, *Forecasting, Data collections, Monitoring, *Thermal stratification, *Mathematical models, Model studies, Solar radiation, Radiation, Thermocline, Air temperature, Wind velocity, Humidity.
Identifiers: Wind-induced mixing processes.

The major portion of this work was devoted to experimental investigation of the response of a reservoir to hydrologic and meteorologic influences. For this purpose an automatic data collection system was designed and constructed. Five meteorologic parameters (solar and long wave radiation, mean wind speed, air temperature, and relative humidity) were monitored. Surveillance of the thermodynamic state of the reservoir was maintained by thermal surveys at intervals of seven to ten days throughout the field observational season. In addition, effort was devoted to the evaluation of a mathematical model for prediction of the thermodynamic and hydrodynamic behavior of a reservoir in response to climatic influences. Based on analyses of the comparison of measured and predicted temperature profiles the mathematical model performed satisfactorily. The longest continuous data period available for the evaluation was 33 days. The model predicted temperature gradients quite successfully but signifi-

cant errors occurred in determination of thermocline depth.
W76-08920

SEDIMENT LOADING, ITS EFFECT ON A SOUTHERN ARIZONA LAKE AND THE EMERGING SPRING ZOOPLANKTON COMMUNITY,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2J.
W76-09073

INFECTION OF BROAD-CLAWED CRAYFISH WITH BRANCHIOBDELLA AND CONTROL MEASURES AGAINST THEM, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
A. A. Mazhilis.
Liet Tsr Mokslu Akad Darb Ser C. 3, p 107-113, 1973.

Descriptors: *Crayfish, *Fish parasites, *Fish diseases, Europe, Lakes, *Pest control, Potassium compounds.
Identifiers: *Branchiobdella, Branchiobdella-Astaci, *Branchiobdella-Pentodonta, USSR, *Lithuanian SSR, Baka Lake, Siemetis Lake.

Investigation of 290 broad-clawed crayfish in the Baka and Siemetis lakes (Lithuanian SSR, Trakai district (USSR)), in 1971 showed that the crayfish had 2 spp. of Branchiobdella, Branchiobdella pentodonta Whitman and B. astaci Odier. All the specimens of commercially valuable crayfish in the Baka lake were intensively infected with B. pentodonta. The B. astaci infection was considerably lower. In the Siemetis lake the crayfish were more intensively infected with B. astaci than with B. pentodonta. Intensity of infection by B. pentodonta in the Baka lake was lowest in winter, in comparison to that in other seasons. The spread of the B. pentodonta infection was favored by direct contact between infected and uninfected crayfish. A KMnO4 solution (1:15,000, 20 min) appeared to be effective as it killed branchiobdellids and did not harm the crayfish.--Copyright 1976, Biological Abstracts, Inc.
W76-09086

MOLLUSKS OF THE CERATOPHYLLUM CARPETS OF LAKE CHAD: BIOMASSES AND SEASONAL VARIATIONS OF THE DENSITY, (IN FRENCH).
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
K. Leveque.
Cah O R S T O M Ser Hydrobiol. 9(1); p.

Descriptors: Mollusks, Africa, Lakes, *Seasonal, *Biomass, *Snails, Sampling.
Identifiers: Bilharziasis, Biomphalaria-Pfeifferi, *Bulinus-Truncatus-Rohlfsi, *Ceratophyllum, Chad, *Lake Chad.

Snails were collected monthly for 1 yr in 4 Ceratophyllum carpels of Lake Chad, Africa. For most of the species, variations in abundance during the year were not correlated with the main ecological factors of the lake. Bulinus truncatus rohlfsi was always found in sample sites and in other stations; Biomphalaria pfeifferi was also frequent. These 2 spp. are bilharsiasic vectors. Bulinus forskalii, Anisus coretus, Gyraulus costulatus, Segmentorbis angustus, Lymnaea natalensis and Ferrissia sp. were also found. Biomass (alcoholic weight per 100 g dry weight of plants) is generally between 1.5-7 g.--Copyright 1976, Biological Abstracts, Inc.
W76-09094

PLANT ASSOCIATIONS OF LAKE MIELIWO AND THE ADJACENT PEAT BOGS IN THE BRODNICA DISTRICT, (IN POLISH),
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology; and Nicolas Copernicus Univ. of Torun (Poland). Zaklad Botaniki Ogolnej.
K. Kepczynski, and A. Zielski.
Acta Univ Nicolai Copernici Biol. 16, p 125-167, 1974.

Descriptors: Lakes, Europe, *Plant groupings, Aquatic plants, Bogs, Forests, Peat, Soils, Willow trees.
Identifiers: Blysmus-Compressus, Brodnica, *Najas-Marina, *Poland(Lake Mieliwo), Potamogeton-Natans.

The size, shape, bottom sludge layer and surrounding deciduous and mixed forests of the lake (in Poland) are described. Najas marina, which is fairly rare, occurs in large numbers. The soil and water conditions of the biotopes of the unclassified willow and meadow formations and the Hydrocharitetum morsus-ranae, Potametum lucentis, Parvopotamo-Zannichellietum najadetosum, Potamogeton natans, Myriophyllo-Nupharetum, Ceratophyllum demersum, Scirpo-Phragmitetum, Acoretum calami, Caricetu paniculatae, Caricetum appropinquatae, Cariectum acutiformis, Caricetum vesicariae, Caricetum ripariae, Scirpetum silvatici, Blysmus compressus, Caricetum lasiocarpae, Carici-Agrostietum caninae, Caricetum diandre and Carici elongatae-Alnetum associations, are also described.--Copyright 1976, Biological Abstracts, Inc.
W76-09099

DIGESTIVE ACTIVITIES OF CARP AS A MAJOR CONTRIBUTOR TO THE NUTRIENT LOADING OF LAKES,
For primary bibliographic entry see Field 5C.
W76-09103

PHOSPHOROUS FLUX THROUGH FISHES,
For primary bibliographic entry see Field 5C.
W76-09104

RECLAMATION OF ACIDIFIED LAKES - MIDDLE AND LOHI, SUDBURY, ONTARIO,
For primary bibliographic entry see Field 5G.
W76-09108

THE CRUSTACEAN PLANKTON OF AN ACID RESERVOIR,
For primary bibliographic entry see Field 5C.
W76-09109

ENVIRONMENTAL CHANGES IN A PORTION OF LAKE ONTARIO FOLLOWING POLLUTION ABATEMENT,
For primary bibliographic entry see Field 5C.
W76-09119

DISCHARGE OF TREATED WASTE WATER IN LAKES (DIE EINLEITUNG VON GEREINIGTEM ABWASSER IN SEEN),
For primary bibliographic entry see Field 5B.
W76-09216

AN EVALUATION OF ERTS DATA FOR OCEANOGRAPHIC USES THROUGH GREAT LAKE STUDIES,
National Environmental Satellite Service, Washington, D.C.
A. E. Strong, and M. G. Stumpf.
Available from the National Technical Information Service, Springfield, Va 22161 as N75-26467, $9.00 in paper copy, $2.25 in microfiche. Final Report, December 1974. 184 p, 63 fig, 10 tab, 45 ref, 1 append.

Descriptors: *Remote sensing, *Great Lakes, *Satellites(Artificial), Water temperature, Algae, Biomass, Circulation, Water circulation, Chemical precipitation, Ice, Lake ice, Pollutants, Water pollution, Lakes, Surface waters.
Identifiers: *ERTS, *NOAA-2, Sunglints.

The main objective of this ERTS-1 work was to exploit satellite-obtained multispectral data for Great Lakes observations. Near-coincident NOAA-2 satellite data were also utilized to provide additional information in the thermal-infrared part of the spectrum. A broad-based approach permitted the development of techniques for monitoring high concentrations of surface biomass and algal blooms in the Great Lakes during late summer and early fall. Chemical precipitation in the near-surface layer was readily observed by ERTS-1 and was found more extensive than previously believed. The high resolution of the MSS instrument permitted ice vector movement studies on successive days where overlapping data were available. These opportunities were infrequent because of extensive cloud cover. Water color displayed a positive correlation with surface water temperature during the spring and early summer months. This correlation reverses for fall and early winter. The most troubling finding was the extensive sunglint contamination. A nearly-complete set of circulation charts were presented for five Great Lakes areas that revealed numerous natural color tracers. (Sims-ISWS)
W76-09244

TEMPERATURE, OXYGEN, AND NUTRIENT DISTRIBUTION PATTERNS IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-09262

OXYGEN DEPLETION IN THE CENTRAL AND EASTERN BASINS OF LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W76-09263

AN AUTOMATIC RELEASE INSTRUMENT WITH UNDERWATER BUOY FOR MARKING OF FIELD EQUIPMENT,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 7B.
W76-09268

THE SEDIMENTS OF HIGH MOUNTAIN LAKE: STRUCTURE: NATURE AND POPULATIONS, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 2J.
W76-09347

THERMAL STRUCTURE OF LAKE MASCARDI (PROVINCE OF RIO NEGRO, ARGENTINA, (IN SPANISH),
Instituto National de Limnologia, Santo Tome (Argentina).
C. E. Drago.
Physis Aguas Cont Org Secc B. 33(87), p 207-216, 1974.

Descriptors: South America, Lakes, Heat budget, *Heat transfer, *Energy budget, *Thermal stratification.
Identifiers: *Argentina(Lake Mascardi), Province Rio-Negro(SA).

The thermal structure of Lake Mascardi and its energy budget and heat transfer at different depths was analyzed during May, 1971-April, 1972. The

lake shows a circulation period from the end of July to the beginning of Oct.; the stratification period extends from the end of Oct. until April. The metalimnion is generally located between 10-40 m depth and the water temperature is always above 5C. The lake belongs to the warm monomictic type. The annual heat budget was 27,934 cal cm-2 with a maximum of 43,442 cal cm-2 (Feb., 1972) and a minimum of 15,508 cal cm-2 (Aug., 1971). The largest negative heat flux (toward the atmosphere) was registered in Aug. (-351 cal cm-2 day -1) while the maximum flux value toward the lake occurred in Oct. (483 cal cm-2 day -1). The thermal characteristics of the lake are similar to those observed in other deep lakes in the temperate region.--Copyright 1975, Biological Abstracts, Inc.
W76-09358

A LAKE POPULATION: THE INTHA OF LAKE INLE. (SOUTHERN SHAN STATES, BURMA), (IN FRENCH),
Ecole Pratique des Hautes Etudes, Paris (France).
M. Bruneau, and L. Bernot.
J Agric Trop Bot Appl. 19(10/11); p 401-441, 1972(1974).

Descriptors: Asia, Lakes, Rice, Human population, Forests, Geography, Water hyacinth, Nuisance algae, Bibliographies.
Identifiers: *Burma, Ceratophyllum, *Dipterocarpus-Tuberculatus, Eichornia-Crassipes, Ephydatia-Fluviatilis, Hydrilla, *Imperata, Inle, Intha, Shan, Utricularia.

Cultural data on the people and a bibliography of geographic, ethnographic and biological works on this area are provided. The Yaungshwe basin contains 2 distinct types of forest: one characterized by Dipterocarpus tuberculatus and associated plants; the other by Imperata. The lacustral zone occupies a portion of the basin and is composed of 3 sections: the central section, characterized by Ceratophyllum; the area around the lake, composed of floating islands of living and dead plants, especially the water hyacinth Eichornia crassipes, a rapidly growing South American plant which is considered a nuisance; and the intermediate paludal zone, the bottom of which is covered with Hydrilla, Ceratophyllum and Utricularia. This last zone is also rich in the sponge, Ephydatia fluviatilis. The principal industry in the area is rice growing.--Copyright 1975, Biological Abstracts, Inc.
W76-09361

FORMATION OF FISH FAUNA OF THE BERDYANSK RESERVOIR IN THE FIRST TWELVE YEARS OF ITS EXISTENCE, (IN RUSSIAN),
Melitopolskii Pedagogicheskii Institut (USSR).
A. S. Loshakov.
Vestn Zool. 5, p 38-44, 1974.

Descriptors: *Reservoirs, *Fish hatcheries, Carp.
Identifiers: Alburnus-Alburnus, Berdyansk Reservoir, Chalcalburnus-Chalcoides-Danubicus, Cobitis-Taenia, Gobio-Gobio, Leucaspius-Delineatus, Leuciscus-Cephalus, Lucioperca-Lucioperca, Neogobius-Fluviatilis, Perca-Fluviatilis, Pretererorhinus-Marmoratus, Rhodeus-Sericeus-Amarus, Rutilus-Frisii, Rutilus-Rutilus, Scardinius-Erythrophthalmus, Ukrainian-SSR, Vimba-Vimba-Vimba-Natio-Carinata, *USSR.

The Berdyansk Reservoir (Ukrainian SSR, USSR) is a habitat for 16 fish species and subspecies (Leuciscus cephalus, Scardinius erythreophthalmus, Leucaspius delineatus, Gobio gobio, Alburnus alburnus, Cyprinus carpio, Rutilus rutilus, R. frisii, Chalcalburnus chalcoides danubicus, Vimba vimba vimba natio Carinata, Cobitis taenia, Neogobius fluviatilis, Preterorhinus marmoratus, Rhodeus sericeus amarus, Lucio-perca lucioperca, Perca fluviatilis), including valuable food-fish (C. carpio L., C. chalcoides danubicus Antipa, V. vimba vimba natio carinata Pall. (21.43%)), food-fish and fish of little value (50%) and 'weed' species (28.57%). In the 1st years of the existence of the reservoir, the quantity of 'weed' and low-value species grew rapidly; then the quantity of valuable food fish increased.--Copyright 1975, Biological Abstracts, Inc.
W76-09392

DISTRIBUTION, CIRCULATION AND EVOLUTION OF NUTRIENTS, PARTICULARLY INORGANIC PHOSPHORUS IN LAKE ETANG DEBERRE: INFLUENCE OF RIVER DURANCE WATERS, (IN FRENCH),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Oceanographie.
For primary bibliographic entry see Field 5B.
W76-09393

LIMNOPLANKTON OF SOME INLAND WATERS OF DACCA CITY,
Dacca Univ. (Bangladesh). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W76-09400

2I. Water In Plants

WATER REGIME IN GROWING POINTS OF WHEAT SHOOTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
L. P. Chel'tsova.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina. 8,p 16-18, 1974.

Descriptors: *Wheat, Crops, Cereal crops, Grains(Crops), *Water requirements, Analysis, *Moisture uptake.

The uptake of water into the growing points of wheat shoots, suction force and osmotic pressure of the sap of the cells of the growing points and leaves as a function of the stage of organogenesis was determined. In the II stage, the uptake of water into the growing points decreased; the decrease was more pronounced in spring than in winter wheat varieties.--Copyright 1976, Biological Abstracts, Inc.
W76-08757

SELF-REGULATION OF THE POPULATION AND BIOMASS OF SCHOOLS OF YEARLING CARP, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
Yu. G. Andreyashkin, and L. A. Dobrinskaya.
Ekologiya. 5(5), p 44-48, 1974.

Descriptors: *Carp, *Fish populations, Biomass, Schools(Fish), Analysis, Regulation, Fisheries.

The density regulation mechanism of coexisting 1st yr carp Cyprinus carpio L. was studied in nursery ponds and aquariums. Statistical analyses show that various factors such as the size and weight of the body, population density, nutritional conditions, reproduction and death rate interact to determine a carp population.--Copyright 1976, Biological Abstracts, Inc.
W76-08832

ZINC NUTRITION OF RICE IN RELATION TO IRON AND MANGANESE UPTAKE UNDER DIFFERENT WATER REGIMES,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India).
For primary bibliographic entry see Field 3F.
W76-08974

EFFECT OF SOIL-MOISTURE REGIMES AND N AND P FERTILIZATION ON BERSEEM GROWN FOR FODDER,
Indian Agricultural Research Inst., New Delhi. Div. of Agronomy.
For primary bibliographic entry see Field 3F.
W76-08987

EFFECTS OF LIME, PHOSPHATE AND SOIL CONDITIONER ON GROWTH AND FRUIT QUALITY OF NETTED MELON, (IN JAPANESE),
Tsuishin Jr. Coll. of Agriculture, Aichi (Japan).
For primary bibliographic entry see Field 3C.
W76-08989

PROBLEM OF BLOOD-SUCKING FLIES IN THE ZONES AFFECTED BY BIG WATER RESERVOIRS IN THE UKRAINIAN SSR, (IN RUSSIAN),
Zaporozhskii Gosudarstvennyi Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 5G.
W76-08991

PLANT COLLECTION FOR SALTLAND REVEGETATION AND SOIL CONSERVATION,
Western Australia Dept. of Agriculture, South Perth. Soils Div.
C. V. Malcolm, and A. J. Clarke.
Western Australia Department of Agriculture, Technical Bulletin No. 21, October, 1973. 34 p, 4 ref.

Descriptors: *Revegetation, *Soil conservation, *Soil-water-plant relationships, *Saline soils, *Planting management, Forages, Salt tolerance, Plant groupings, Drought tolerance, Australia, Africa, Asia.
Identifiers: Israel, Tunisia, Algeria.

Listings of over 350 plants were added to a collection of 343 already under observation to determine suitability for forage production in saline and arid regions. New accessions for the test program include shrubs from Tunisia, Algeria, Israel, and Australia. Some plants were collected for their special suitability in revegetation of coastal dunes, road verges and mine spoil dumps. The extensive tables provide information on both the botanical and common name, locality and altitude, habitat, and description of the species added. Habitats include rainfall where known, character of soils, and particular water environment such as salt lakes, margins of seepage, beaches, swamps, river banks, and flood plains. (Jahns-Arizona)
W76-09071

LATE PLEISTOCENE AND MODERN PLANT COMMUNITIES OF SHINUMO CREEK AND PEACH SPRINGS WASH, LOWER GRAND CANYON, ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
T. R. Van Devender, and J. T. Mead.
Journal of the Arizona Academy of Science, Vol. 11, No. 1, p 16-22, February, 1976. 1 fig, 1 tab, 10 ref.

Descriptors: *Pleistocene epoch, *Plant populations, *Vegetation, *Plant groupings, *Environmental effects, Paleoclimatology, Juniper trees, Forests, Xerophytes, Biological communities, Desert plants, Arid climates, Pinyon pine trees, Climates, *Arizona.
Identifiers: *Plant fossils, Shinumo Creek(Ariz), Peach Springs Wash(Ariz), *Climatic depression, Grand Canyon, Rampart Cave(Ariz), Packrat middens.

Plant macrofossils in late Pleistocene packrat (Neotoma sp) middens were found near Shinumo Creek and Peach Springs Wash in the Grand Canyon. Plant fossils preserved in such deposits provide excellent records of contemporary local

plant communities as well as past vegetation and climate. The two middens reported document xerophilous woodland as low as 735 and 860 m in the Grand Canyon from 12,000 to 13,600 radiocarbon years ago. Most plants identified from the samples now occur at 1200 m elevation. Using this as a modern analogue, estimates of climatic depression of these early plant communities are 340-465 m, although similar vegetation occurred at that time as low as 430 m in the Rampart Cave area, with a depressional estimate of at least 1000 m. Of more interest than the species found was the absence of Pinus monophylla or P. edulis and Artemisia tridentata in midden samples, although the present lower limits for pinyon and juniper are very close in this area. Juniper woodland had a greater elevational amplitude then today in the Grand Canyon. These records support the hypothesis that plant species respond to changing environments individualistically rather than plant communities being depressed in units. (Jahns-Arizona)
W76-09074

GROWTH, WATER CONSUMPTION, AND SALT UPTAKE OF TOMATO PLANTS IN HIGH HUMIDITY- HIGH CARBON DIOXIDE GREENHOUSE ENVIRONMENTS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 3C.
W76-09075

THE PHRAGMITETEA AND MOLINIETALIA ASSOCIATIONS IN THE THAYA, MARCH AND DANUBE RIVER BASINS OF AUSTRIA, (IN GERMAN),
For primary bibliographic entry see Field 4A.
W76-09076

THE PERIPHERAL FLOOD ZONES OF GNIEWKOWO LOWLAND FROM 1969 TO 1972, (IN POLISH),
Nicolas Copernicus Univ. of Torun, Ilawa (Poland). Dept. of Hydrobiology.
J. Wilkon-Michalska, and N. Dmitrenko.
Acta Univ Nicolai Copernici Biol. 16, p 169-190, 1974.

Descriptors: Europe, Succession, Meadows, Pastures, Reeds, Floods, *Aquatic plants, Stagnant water, Shrubs.
Identifiers: Ceratophyllum-Demersum, Deschampsia-Caespitosa, Oenanthe-Aquatica, Phragmites-Communis, *Poland(Gniewkowo), Polygonum-Amphibium-f-Natans, Potamogeton-Lucens, Potentilla-Supina, *Aquatic plant succession.

The plant successions at 10 localities (in Poland) containing stagnating flood water were studied. Typical hydrophytes, Ceratophyllum demersum, Potamogeton lucens and Polygonum amphibium f. natans, predominated in the water. Reeds, especially Phragmites communis, covered 1/3 of the flooded meadows, pastures and fields. Dense Oenanthe aquatica occupied shallow, sludgy, dried up reservoirs; these were later replaced by shrubs. The northern periphery of the flood areas was covered with therophytes, primarily Potentilla supina, after the water level fell. Fragments of higher meadows and pastures had fewer species and were dominated by hydrophytes such as Deschampsia caespitosa after the flood.--Copyright 1976, Biological Abstracts, Inc.
W76-09079

HYDROTHERMIC REGIME AND PRODUCTIVITY OF FORESTS OF NATURAL ORIGIN, (IN RUSSIAN),
R. I. Florov.
Lesovedenie. 3, p 21-28, 1975.

Descriptors: Forest management, Nutrients, Production, Metabolism, Soil moisture, Vegetation, Leaves, Cycles, Fir trees, Spruce trees, Pine trees.
Identifiers: Hydrothermic regimes(Forests).

Nutrient regimes of natural forests, potential production and metabolism are functions of hydrothermic conditions. This is common for natural forests which periodically return nutrients to the soil. Quantitative relationships of stand production with the hydrothermic regime were established by 2 methods: a semi-empirical method using curves describing the annual course of soil moisture and the duration of the vegetative period; and the method of dissipation in the leaf system. (Data from pine, spruce and fir forests are discussed.)--Copyright 1976, Biological Abstracts, Inc.
W76-09080

VEGETATIONAL STRATA IN PERHUMID AND PERARID REGIONS OF THE TROPICAL ANDES, (IN GERMAN)
H. Ellenberg.
Phytocoenologia. 2(3/4), p 368-387, 1975.

Descriptors: *Primary productivity, Forests, Grassland, *South America, *Vegetation, Tropics, *Humidity, Arid climates, Leaves, Semi-arid lands.
Identifiers: Andes, Argentina, Chile, Colombia.

The Andean Mountains and the adjacent lowlands, from southern Colombia to northern Chile and Argentina, offer an unique opportunity to study the variation of vegetation with the altitude as well as with the degree of humidity of climate within the tropics. This variation is represented schematically, using the number of arid months as the horizontal and the altitudinal belts as the vertical axis. Primary productivity is highest in the humid, not in the perhumid lowlands. More realistic graphs may give an idea of the structure of the zonal plant formation in a perhumid, in a semihumid to semiarid and in an arid climate. Climatic diagrams of the daily movement of air temperature and relative humidity were developed which show the more or less wet and dry hours. Where possible, climatic diagrams with monthly average temperature and rainfall (according to Walter) are added. The abundance of vascular and cryptogamic epiphytes depend mainly on the degree of humidity at midday in the growing season, may this be caused by fog drift or frequency of rain fall. Drip tips on the leaves are lacking in the wettest forest climate (i.e., in the upper montanous belt) but are quite frequent where the average temperature is above 15 C, the whole growing season is humid, and the dry season is not longer than 4 mo. Under these conditions, most leaves normally have no or only a thin and individual bud protection, and their tip is already differentiated when the lamina begins to enlarge quickly, thus causing a curved transition to the tip. Most natural forest and woodland types have been partially or nearly totally replaced by grassland which has been regularly burned and grazed since the Spanish conquest or even longer.--Copyright 1976, Biological Abstracts, Inc.
W76-09083

PROTECTION OF ROMANIAN UNDERGROUND WATER FAUNA, (IN ROMANIAN),
Academia R. S. R., Cluj. Institutul de Spelologie.
L. Botosaneanu.
Ocrotirea Nat. 16(1), p 43-46, 1972.

Descriptors: Europe, Groundwater, Karst, Caves, Springs, Underground streams, *Fish.
Identifiers: *Dendrocoelum-Afine, *Dendrocoelum-Atriostrictum, *Dendrocoelum-Banaticum, *Niphargus-Spp., *Romania.

Karstic waters are little affected by technological activities. The number of caves used for tourist purposes is still small. Human activities are not known to have an impact on aquatic cave fauna. The habitats involved include springs in hill, plateau, and plain areas, and streams. These are the habitats of depigmented and blind species of the family Dendrocoelidae and genus Niphargus which are in danger of vanishing. This is the case of Dendrocoelum atriostrictum, D. banaticum, D. (Polycladodes) afine, etc. These species occurred in various springs which are involved in industrial developments, municipal uses, etc.--Copyright 1976, Biological Abstracts, Inc.
W76-09085

INTERRELATION BETWEEN WEIGHT AND LINEAR INDICES IN BLACK SEA OYSTERS, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
T. F. Krakatitsa, and A. G. Paflai.
Izv Akad Nauk SSSR Ser Biol. 3, p 428-438, 1975.

Descriptors: *Oysters, Weight, *Shellfish farming, Biomass, Measurement, Estimating, *Commercial shellfish, *Statistics, Length.
Identifiers: Ostrea-Edulis-Var.-Taurica, *Black Sea oysters.

The interrelations of linear and weight indices in Black Sea oysters (Ostrea edulis var. taurica) were statistically analyzed using several years' experimental data and expedition materials. General mass, valve mass and the body mass depend on the height which is sufficiently clearly reflected by the equation of the power parabola W = aHb. The linear and quadratic dependencies due to the simplicity of calculations and the fair coincidence between actual and calculated weights were used for estimating oyster weight according to the linear measure. No similar investigations were carried out so far regarding Black Sea oysters. The establishment of the 1st experimental commercial oyster farm makes this of practical value for estimating biomass yield.--Copyright 1976, Biological Abstracts, Inc.
W76-09087

ON THE HISTOLOGICAL STRUCTURE AND FUNCTION OF DIGESTIVE ORGANS OF THE FED AND STARVED LARVAE OF THE YELLOWTAIL, SERIOLA QUINQUERADIATA, (IN JAPANESE),
Kochi Univ. (Japan). Inst. of Fisheries.
Umeda, Susumu, Ochiai, and Akira.
Jpn J Ichthyol. 21(4), p 213-219, 1975.

Descriptors: Larvae, *Fish diets, *Rotifers, *Fish food organisms, Fish hatcheries.
Identifiers: Seriola-Quinqueradiata, *Yellowtail larvae.

The early critical period of S. quinqueradiata larvae was studied. larvae were reared in laboratory tanks for 10 days after hatching, with or without food. In starved larvae the digestive organs were normal in histological structure and digestive function on the 4th day, but degenerated strikingly on the 6th-9th day after hatching. Larvae of the fed group receiving rotifers (3 5 individuals/ml seawater) as food from the 4th day were classified into starved, semistarved and normally feeding types. Starved type larvae possessed the same histological features as the larvae of starved group. The semistarved type had a histologically normal digestive tract, but rotifers were not seen in the intestinal lumen. Starved larvae were 70% and the semistarved type were 0% at day 6, 46% and 27% at day 7, 5% and 39% at day 9, respectively. The unfavorable feeding condition in the early period (4th-6th day after hatching) appears to be the main cause of mortality of yellowtail larvae reared in laboratory tanks.--Copyright 1976, Biological Abstracts, Inc.
W76-09088

PERIODICITY IN THE BIOMETRIC VARIATIONS OF LOXECHINUS ALBUS MOLINA, (IN SPANISH),
Universidad de Norte, Antofagasta (Chile). Sede Anatogagasta.
M. Gutierrez, Juan, V. Otsu, and Ines.
Rev Biol Mar. 15(2), p 179-199, 1975.

Descriptors: Commercial fish, Cycles.
Identifiers: Biometric variation, Chile, *Loxechinus-Albus, *Sea urchin.

L. albus Mol. is the edible sea urchin of the Chilean coast. The biometric variations in different periods of the year (1965, 1966, 1971) are analyzed. The samples studied were obtained in 'Caleta de Hornos' (22 54' 50''S and 70 18'20''W). Sea urchins (1828) were studied, which meant a monthly average of 141 specimens. The results of biometric determinations are given.--Copyright 1976, Biological Abstracts, Inc.
W76-09089

PHYSIOLOGICAL EVALUATION OF THE NUTRITIONAL VALUE OF ARTIFICIAL FISH FEEDS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khoziaistva, Rybnoe (USSR).
M. A. Shcherbina.
Vopr Ikhtiol. 15(2), p 338-345, 1975.

Descriptors: *Fish diets, *Fish food organisms, Nutrients, Protein, Energy, *Fish physiology, Evaluation.

A comprehensive method for determining the nutritional value of artificial fish feeds is proposed based on a determination of the most important components of the feed (dry matter, crude protein and energy) with respect to 6 indices: chemical composition of feed, digestibility of nutrients, expenditures of gross and digestible nutrients per unit weight gain, effectiveness of utilization of nutrients for weight gain by the fish, rate of increase of body weight and content of nutrients per unit weight gain. Equations for determining the indices are presented.--Copyright 1976, Biological Abstracts, Inc.
W76-09090

BIOCHEMICAL CHARACTERISTICS OF SPIRULINA PLATENSIS (GOM.) GEITL.: I. WATER-SOLUBLE GROUP B VITAMINS, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
N. D. Tupyk, and S. I. Los'.
Ukr Bot Zh. 32(1), p 39-41, 1975.

Descriptors: Vitamins, *Vitamin B, *Algae, Cultures, Solubility, Biochemistry.
Identifiers: *Spirulina-Platensis.

The effect of the culture age on the content of group B vitamins was studied in pure cultures of S. platensis under laboratory conditions. Vitamin content was maximal in intensively growing cultures. Definite differences were shown in the content of group B vitamins in algae of different species. S. platensis is a rich source of vitamins.--Copyright 1976, Biological Abstracts, Inc.
W76-09091

EFFECT OF FOOD CONCENTRATION ON EFFICIENCY OF ITS ASSIMILATION BY PLANKTONIC CRUSTACEANS WITH DIFFERENT FEEDING MECHANISMS, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
G. A. Pechen-Finenko.
Gidrobiol Zh. 9(5), p 97-104, 1973.

Descriptors: *Crustaceans, *Fish food organisms, Absorption, *Fish diets, Plankton, Metabolism.

Differences in crustacean feeding mechanisms give grounds to assume that this factor determines the main regularities in the assimilation of food by animals. To check this hypothesis, the literature was analyzed and data on the dependence of assimilation efficiency on food concentration and quantity of food consumed were related with feeding characteristics. Data on the assimilability and assimilation efficiency as a function of the food concentration and quantity of food consumed for filter-feeding crustaceans and seizing crustaceans show that under natural conditions both can regulate sufficiently well the process of consumption and assimilation of food, and that superfluous feeding cannot be considered characteristic for animals under natural conditions.--Copyright 1976, Biological Abstracts, Inc.
W76-09092

EFFECT OF HARDENING ON THE STATE OF WATER IN SEEDLINGS OF WINTER CULTURES, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
I. M. Vasil'eva, N. N. Ishmukhametova, N. A. Galiev, and V. I. Khisamutdinova.
Fiziol Rast (Mosc). 22(2), p 376-380, 1975.

Descriptors: *Wheat, *Rye, Leaves, *Frost, Energy, Ions, *Cytological studies, Freezing, Cultures.
Identifiers: Frost resistance(Plants).

Low-frequency electrical resistance was measured in the leaves of seedlings (wheat, rye) of winter cultures during hardening, as well as the effect of temperature on this parameter. Low-frequency resistance is higher in frost-resistant plants in which it increases with hardening and depends on temperature to a lesser degree. The higher the frost-resistance of the seedlings, the lower activation energy of the ion mobility before hardening. This energy increases with a decrease of temperature during hardening of the plants, the more so the higher is the frost resistance. Changes in the energy of activation of the ion mobility as a result of hardening are related to an increase of viscosity of the intercellular liquid caused by liberation of natural protective substances. This produces amorphous ice in the cell walls during freezing.--Copyright 1976, Biological Abstracts, Inc.
W76-09095

EFFECT OF AIR HUMIDITY ON STOMATAL AND MESOPHYLL CONDUCTIVITY OF BEAN LEAVES AT TWO SOIL MOISTURE LEVELS, (IN RUSSIAN)
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
K. A. Moldau, and A. Y. Syber.
Fiziol Rast. 21(4), p 800-806, 1974.

Descriptors: Leaves, Humidity, *Beans, *Stomata, *Soil moisture, Carbon dioxide, Conductivity, Transpiration, Soil-water-plant relationships.
Identifiers: *Mesophyll conductivity, Phaseolus-Vulgaris, *Air humidity.

The stomatal and mesophyll conductances and the CO2 relative humidity compensation point of intact bean Phaseolus vulgaris leaves were measured at low (10-30% relative humidity (RH) and high (85-97% RH) air humidity at 2 soil moisture levels (70 and 50% of total capacity). The stomatal conductance decreased with air humidity at both soil moisture levels with the elative decrease in the stomatal conductance being higher at a higher soil moisture level. As the transpiration rate into drier air remained higher, the stomatal response to air humidity was possibly explained without involving the mechanism of the peristomatal transpiration. On the basis of experimental evidence and mathematical analysis of water transport throughout the soil-plant atmosphere system, it was shown that the stomatal response to air humidity and soil water potential depends on the shape of the stomatal conductance-leaf water potential relationship and on the resistance to water movement in the liquid phase. The mesophyll conductance and the C2 compensation point did not depend on soil moisture and air humidity within the range of changes in the stomatal conductance from 0.9-0.06 cm/s for CO2.--Copyright 1976, Biological Abstracts, Inc.
W76-09097

MEADOW VEGETATION AND FORAGE RESOURCES OF THE URAL RIVER FLOODPLAIN, (IN RUSSIAN)
For primary bibliographic entry see Field 4A.
W76-09098

PLANT ASSOCIATIONS OF LAKE MIELIWO AND THE ADJACENT PEAT BOGS IN THE BRODNICA DISTRICT, (IN POLISH),
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology; and Nicolas Copernicus Univ. of Torun (Poland). Zaklad Botaniki Ogolnej.
For primary bibliographic entry see Field 2H.
W76-09099

FIRST OBSERVATIONS ON THE FOREST OF CAMEROON ON SANDY COASTAL CORDONS, (IN FRENCH)
Museum National d'Histoire Naturelle, Paris (France). Laboratoire de Phanerogamie.
R. Letouzey.
Adansonia. 14(4), p 529-542, 1975.

Descriptors: Africa, Bogs, Soils, *Vegetation, Forests, Coasts, Sands, Mangrove swamps.
Identifiers: *Cameroon, *Coastal cordons, *Rhizophora-Racemosa, *Mangroves.

On the Atlantic coastline of Cameroon, it is possible to distinguish 5 principle sectors: near Nigeria, a vast bogland colonized by the mangrove Rhizophora racemosa; SE of the 1st sector an area reaching from an active volcano emitting molten basalt lava to the ocean; to the SE, a zone with warping subsoil, also colonized by R. racemosa; at the estuary of the Wouri, an unusual flat sandy zone interrupted by estuaries of the important Sanaga and Nyong Rivers; and, near Kribi, a coastline formed by crystalline and gneissic soil. Plant species are listed for the several zones, for periodically inundated forests, boggy areas, young forests on recent cordons and old forests on ancient sandy cordons.--Copyright 1975, Biological Abstracts, Inc.
W76-09100

EFFECT OF THE WATER REGIME ON THE HEAT-RESISTANCE OF LEAF CELLS OF HEAT-HARDENED TRADESCANTIA FLUMINENSIS VELL. PLANTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
I. G. Zavadskaya, and G. G. Shukhtina.
Bot Zh (Leningrad). 59(7), p 1055-1058, 1974.

Descriptors: *Plant grouping, Drought, *Leaves, *Moisture content, Water loss, *Drought resistance, Cytological studies, Soils, Plant physiology.
Identifiers: Protoplasma, *Tradescentia-Fluminensis.

Two groups of T. fluminensis were subjected to soil drought until water deficit in the leaves reached 35%, after which plants of 1 group (group 2) were heat-hardened in a thermostatically-controlled chamber for 3 h at 38C, along with a 3rd group which had not been subjected to drought. All plants were placed under room temperature, and water content and heat-resistance, determined by cessation of protoplasmic movement after 5 min of heating, of the leaves were measured. Water content in the 3rd group and in a control group remained the same throughout the experiment (18 days) but in group 1 and 2 it slowly

decreased to 64% less than in the controls by the 18th day. Heat-resistance in the controls and group 1 was the same, which indicated that in this species water deficit did not affect primary heat-resistance. Hardening induced increased resistance in both the 2nd and 3rd groups, but it decreased in the 3rd group to control level in 7 days, while remaining high in group 2 until the end of the experiment. Watering the group 2 plants produced the same decrease as in group 3 thus proving that water deficit in the cells stabilizes heat-resistance in heat-hardened plants.--Copyright 1976, Biological Abstracts, Inc.
W76-09102

MERCURY UPTAKE IN ROOTED HIGHER AQUATIC PLANTS; LABORATORY STUDIES,
For primary bibliographic entry see Field 5C.
W76-09111

PHASE IV: BIOLOGY,
Gulf Coast Research Lab., Ocean Springs. Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09242

2J. Erosion and Sedimentation

SOIL AND WATER CONSERVATION WITH WESTERN IOWA TILLAGE SYSTEMS,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
For primary bibliographic entry see Field 4D.
W76-08805

COCCOLITH SEDIMENTATION BY FECAL PELLETS: LABORATORY EXPERIMENTS AND FIELD OBSERVATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08954

SEDIMENT LOADING, ITS EFFECT ON A SOUTHERN ARIZONA LAKE AND THE EMERGING SPRING ZOOPLANKTON COMMUNITY,
Arizona Univ., Tucson.
K. S. Hanks.
Journal of the Arizona Academy of Science, Vol. 11, No. 1, p 3-6, February, 1976. 4 fig, 1 tab, 6 ref.

Descriptors: *Sediment load, *Lake sediments,*Thermocline, *Zooplankton, *Rainfall-runoff relationships, Rotifers, Aquatic microorganisms, Turbidity, Dissolved oxygen, Impact(Rainfall), Water temperature, Arizona, Lakes.
Identifiers: Secchi disk transparency, Filter feeding, Pena Blanca Lake(Ariz).

A study of the Pena Blanca Lake area of Southern Arizona revealed that rainfall and its sediment loading can forestall thermocline development for many weeks and reduce zooplankton numbers. During late February and early March, 1973 heavy rainfall in the lake's watershed caused a sudden influx of silt-laden water into the reservoir. Secchi disk transparency readings dropped first, from 134 cm on February 17 to 25 cm on March 3; total zooplankton numbers fell from 906,000/cu m to 30,000/cu m between March 3 and March 17. The overall water column temperature decreased from 9.8 C in February to 7.8 C in March. This combination of factors probably accounts for delayed thermocline development (which was still weak in April, one month after stratification normally occurs). The ability of Polyarthra trigla to increase its numbers after March 17 seems to be a function of decreasing turbidity. Sediment loading is especially devastating to communities such as zooplankton which depend on filter feeding. (Jahns-Arizona)
W76-09073

VEGETATION AND LANDSLIDES, (IN FRENCH),
Toulouse-3 Univ. (France). Lab. of Botany and Biogeography.
For primary bibliographic entry see Field 4C.
W76-09101

THE AVAILABILITY OF 137-CS TO FISHES FROM INGESTED CLAYS,
For primary bibliographic entry see Field 5C.
W76-09118

THE FORMATION AND DETECTION OF METAL DISPERSION HALOS IN ORGANIC LAKE SEDIMENTS,
Geological Survey of Canada, Ottawa(Ontario).
M. H. Timperley, and R. J. Allan.
Journal of Geochemical Exploration, Vol. 3, No. 2, p. 167-190, May 1974, 9 fig, 2 tab, 62 ref.

Descriptors: *Heavy metals, *Trace elements, Geochemistry, Geologic investigations, *Lake sediments, *Pollutant identification, Lakes, *Canada.
Identifiers: *Gyttja, *Prospecting mediums, Geochemical exploration.

The appplication of organic rich lake sediment, gyttja, to exploration geochemistry is discussed. Gyttja was collected from 42 lake sites in the Red Lake-Uchi Lake volcanic-sedimentary sequence. The chemical composition and nature of the gyttja samples, analysis of the trace metal content and its relation to the geology of the sample's environment, the analytical method involved in this technique, and the interpretation of data are described. (Hoyle-Vanderbilt)
W76-09129

SEDIMENT TRANSPORT, TURBIDITY, CHANNEL CONFIGURATION, AND POSSIBLE EFFECTS OF IMPOUNDMENT OF THE MAD RIVER, HUMBOLDT COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. M. Brown, III.
Available from the National Technical Information Service, Springfield, Va., 22161, as ADAO 23721, $4.50 printed copy, $2.25 microfiche. Water-Resources Investigations 26-75, December 1975. 63 p, 24 fig, 3 tab, 28 ref.

Descriptors: *Pre-impoundment, *Baseline studies, *Sediment transport, *Turbidity, *Environmental effects, *California, Model studies, Forecasting, Streamflow, Reservoirs, Sediments, Sediment discharge, Sediment distribution, Sediment load, Flood control, Regulated flow, Channel morphology.
Identifiers: *Mad River(Calif), Humboldt County(Calif).

The effects of a proposed U.S. Army, Corps of Engineers impoundment on the Mad River, Humboldt County, Calif., projected on the basis of a regulated flow model for the river, include the following: (1) The proposed impoundment would trap about 60 percent of the potential beach-forming sediments transported by the river under unregulated conditions. (2) Release flows from the impoundment would have the capacity to transport the expected inflow of sediment particles less than 2 mm in diameter for the reach of river downstream from the impoundment site. (3) Release flows from the proposed impoundment would have the capacity to transport about 130,000 ton/yr (120,000 t/yr) of bed material particles less than 3 in (76 mm) in diameter. The release flows would be expected to degrade the Mad River channel for a maximum of about 15 mi (24 km) downstream from the impoundment. Degradation of the Mad River channel would ultimately reduce the number and scale of preimpoundment lateral adjustments of the channel for the 15-mi (24-km) reach. Downstream from the initial 15-mi (24-km) reach, artificial adjustments of the channel and flood plain would be expected to override most release-flow effects of channel adjustments. (4) Turbidity of impoundment release flows could approximate preimpoundment turbidity for an average year. (Woodard-USGS)
W76-09136

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, MISSISSIPPI.
For primary bibliographic entry see Field 2L.
W76-09238

PHASE III: SEDIMENTOLOGY,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 2L.
W76-09241

THE EFFECT OF POLYACRYLAMIDE ON THE SETTLING OF THAMES MUD,
Atomic Energy Research Establishment, Harwell (England).
P. Biddle, T. V. Healy, and H. A. C. McKay.
Available from the National Technical Information Service, Springfield, Va 22161 as ARERE R7907, $4.00 in paper copy, $2.25 in microfiche. Report AERE-R7907, January 1975. 34 p, 22 fig, 2 tab, 10 ref.

Descriptors: *Settling velocity, *Mud, *Sea water, Laboratory tests, Dewatering, Suspended solids, Sedimentation, Rivers, Channeling, Sedimentology.
Identifiers: *Thames River(England), *Polyacrylamide.

Laboratory studies have been made of the settling of Thames mud in 20% sea water, with and without added PAM (polyacrylamide). Besides small-scale tests in 100 ml measuring cylinders, experiments were also made in columns several feet long. It was found that initial settling rates were greatly increased by addition of PAM, provided the mud suspension was only mildly agitated before settling; otherwise the PAM had no effect. Dewatering of a consolidating mud, and the bearing strength of a given degree of dewatering, were also increased by PAM. A striking feature in many of the experiments reported was channelled flow in both upward and downward directions during settling. (Sims-ISWS)
W76-09243

FINITE ELEMENT MODEL FOR COHESIVE SEDIMENT TRANSPORT,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-09264

A LIGHT WEIGHT CORER FOR SAMPLING SOFT SUBAQUEOUS DEPOSITS,
University Coll., Dublin (Ireland). Dept. of Zoology.
D. A. Murray.
Limnology and Oceanography, Vol. 21, No. 2, p 341-344, March 1976. 1 fig, 3 ref.

Descriptors: *Cores, *Sediments, *Sampling, Equipment, Bottom sediments, Lake sediments, Bottom sampling, Sedimentology, Limnology.
Identifiers: *Sediment corers.

A light-weight piston corer to obtain sedimentary cores up to 2.0 m long from soft subaqueous deposits was described. This corer, which may be used in any depth of water, uses cord rubber as the driving force to propel a core tube into the sediments. (Sims ISWS)
W76-09266

PREDICTION OF METEOROLOGICAL FACTORS RELATED TO BEACH EROSION AT NEW JERSEY AND LONG ISLAND, N.Y.,
National Weather Service, Garden City, N.Y. Eastern Region.
For primary bibliographic entry see Field 2L.
W76-09270

THE SEDIMENTS OF HIGH MOUNTAIN LAKE: STRUCTURE: NATURE AND POPULATIONS, (IN FRENCH),
Toulouse-3 Univ. (France). Laboratoire d'Hydrobiologie.
N. Giani, and C. Lucas.
Ann Limnol. 10(3), p 223-244, 1974.

Descriptors: *Lake sediments, Lakes, Sampling, Europe, Aquatic animals, Distribution patterns.
Identifiers: *France(Lake Port-Bielh), *Mountain lakeS, Pyrenees Mts.

The vertical variations of physical and faunistic components in cores of sediment samples from the profundal zone of Lake Port-Bielh (Central Pyrenees (France)) were analyzed. These sediments are particularly fine (100% less than 50 microns) and muddy. Their structure is formed by constant suspension and decantation as well as through the activity of benthic organisms. The nature of the sediment does not reflect the chemical composition of the surrounding basin, but is the product of an important movement of ions in solution. The maximal population density is found in the superficial layers but the vertical distribution varies among groups. The modalities of these distributions are described.--Copyright 1975, Biological Abstracts, Inc.
W76-09347

2K. Chemical Processes

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES-I. LITERATURE REVIEW,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-08767

HYDROGEOLOGICAL CONDITIONS OF AL-HAMAD AREA, IRAQ,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2F.
W76-09068

CHEMILUMINESCENT METHOD OF DETERMINING MANGANESE IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
B. I. Nabivanets, and N. A. Truba.
Gidrobiol Zh. 9(5); p 90-93, 1973.

Descriptors: *Manganese, *Analytical techniques, Natural waters, Methodology, *Photometry, Oxidation, Organic compounds, Pollutant identification.
Identifiers: *Chemiluminescent method.

The chemiluminescent method, based on the catalytic action of Mn in the oxidation reaction of luminol H2O2, was used for determination of Mn in natural waters. The total light emitted in the reaction was determined on the basis of the density of a photographic plate measured on a microphotometer. To determine the gross content of Mn in natural waters, preliminary oxidation of the organic compounds in them is necessary.--Copyright 1976, Biological Abstracts, Inc.
W76-09077

EXPEDIENT TECHNIQUE OF PERMANENT OBSERVATIONS -- AN INDISPENSABLE TOOL ON STUDYING THE LIMNOLOGY OF RIVERS,
For primary bibliographic entry see Field 7B.
W76-09106

THE FORMATION AND DETECTION OF METAL DISPERSION HALOS IN ORGANIC LAKE SEDIMENTS,
Geological Survey of Canada, Ottawa(Ontario).
For primary bibliographic entry see Field 2J.
W76-09129

GROUND-WATER DATA FOR SUNFLOWER COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09140

GROUND-WATER DATA FOR CARROLL COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09141

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN CHAMBERS, LIBERTY, AND MONTGOMERY COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09144

WATER RESOURCES OF WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-09149

METHODS AND INSTRUMENTS FOR MONITORING SURFACE WATER AND WASTE WATER QUALITY (VERFAHREN UND GERAETE ZUR UEBERWACHUNG DER OBERFLAECHEN- UND ABWASSERQUALITAET).
For primary bibliographic entry see Field 5A.
W76-09192

ANALYTICAL CHEMISTRY IN WATER POLLUTION CONTROL,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5A.
W76-09221

PHOSPHATE DETERMINATIONS IN WATERS USING AN ANION EXCHANGE RESIN,
Missouri Agricultural Experimental Station, Columbia.
For primary bibliographic entry see Field 5A.
W76-09370

CHEMICAL ANALYSES OF CAMPBELL ISLAND FRESH WATER,
Auckland Univ. (New Zealand). Marine Research Lab.
F. J. Taylor.
N Z J Mar Freshwater Res. 8(2); p 389-402, 1974.

Descriptors: *Chemical analysis, Sampling, *Freshwater, Ions, Calcium, Potassium, Magnesium, Salts, Sea water.
Identifiers: *New Zealand, *Campbell Island(NZ).

Ten samples of freshwater from Campbell Island (New Zealand) were analyzed for their main ionic constituents. All show a preponderance of sodium and chloride derived from sea water. K, Ca and Mg gave slightly higher concentrations than would be expected if derived solely from sea water. The excess K is derived from the underlying rocks and soil, and the excess Ca and Mg from the sea by fractionation into salt particles.--Copyright 1975, Biological Abstracts, Inc.
W76-09395

2L. Estuaries

MERCURY CONCENTRATIONS IN SPRING AND FALL ZOOPLANKTON OF THE ESTUARY OF THE AROSA RIVER, (IN SPANISH),
Instituto Espanol de Oceanografia, Madrid (Spain). Central Laboratories.
For primary bibliographic entry see Field 5C.
W76-08768

THE EFFECT OF FERTILIZATION ON THE SPECIES COMPOSITION OF SALT MARSH DIATOMS,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5C.
W76-08774

MERCURY CONTENT OF BIOTA IN COASTAL WATERS IN HAWAII,
Hawaii Univ., Honolulu. Pacific Biomedical Research Center.
For primary bibliographic entry see Field 5C.
W76-08776

HYPERHALINE ENVIRONMENTS OF THE COMPLEX OF BAGES-SIGEAN, THE LAGOON OF THE DOUL, (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
H. Boutiere.
Vie Milieu Ser B Oceanogr. 24(2), p.355-377, 1974. (Engl. summ.).

Descriptors: *Ponds, *Lagoons, Europe, *Hydrology, *Salinity, Inorganic compounds, *Halides, Temperature.
Identifiers: Bages-Sigean, Doul pond, *France.

In the lagoon system of Bages-Sigean, permanent hyperhaline waters are almost exclusive to the pond of the Doul near Peyriac-de-Mer (France). A general description of this pond is given; its hydrology is characterized by a high salinity (50-60%), high summer temperature (30 C) and the absence of stratification. The recent history of the pond is tentatively reconstructed from the remanent salinities of the mud. The nutritional elements come from the western threshold where the only communication with the lagoon of Sigean is located.--Copyright 1976, Biological Abstracts, Inc.
W76-08784

INSHORE EFFECT OF POLLUTION ON THE BIOTA OF THE BALTIC, SOUTHERN FINLAND,
For primary bibliographic entry see Field 5C.
W76-08791

ALGAL GROWTH POTENTIAL OF SIX NORWEGIAN WATERS RECEIVING PRIMARY, SECONDARY AND TERTIARY SEWAGE EFFLUENTS,
For primary bibliographic entry see Field 5C.
W76-08794

WIND-DRIVEN FLOW OF WATER INFLUENCED BY A CANOPY,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2H.
W76-08801

AREAL AND SEASONAL VARIATIONS IN THE CHEMISTRY OF SUSPENDED PARTICULATE MATTER IN A DEEP WATER FJORD,
Endinburgh Univ. (Scotland). Grant Inst. of Geology.
N. B. Price, and J. M. Skei.
Estuarine and Coastal Marine Science, Vol. 3, No. 3, p 349-369, 1975. 8 fig., 3 tab., 30 ref.

Descriptors: *Mineralogy, *Chemical property, *Suspended solids, *Fjords, Distribution, Aluminum, Silica, Calcium, Magnesium, Manganese, Potassium, Phosphorus, Sulfur, Titanium, Zinc, Lead, Sea water, Geochemistry, Estuaries, Bottom sediments.
Identifiers: *Hardangerfjorden(Norway), Marine waters.

To study variations in origin and behavior of elements associated with organic matter, areal and seasonal studies were made of silica, aluminum, titanium, calcium, magnesium, iron, manganese, potassium, phosphorus, sulfur, zinc, and lead in suspended particulate matter in water profiles of Hardangerfjorden, Norway. Attempts were made to partition these elements between terrigenous, skeletal, organic, and authogenic constituents. Elements denoting terrigenous matter, especially aluminum, were situated at or above the pycnocline during high river runoff periods. When runoff was minimal in spring and upper waters essentially isohaline, aluminosilicates were in the maximum biological productivity zone which had high particulate sulfur and phosphorus and may have been associated with plankton. Calcium and biogenous silica were high in upper waters. Measurements of organic matter decomposition during drying and storage showed that element losses were higher in upper waters than in deeper waters. Decreases in phosphorus, manganese, zinc, and lead between surface and underlying waters suggested that these elements could release rapidly in euphotic zone waters and only small amounts of these organically bound elements would survive fallout to the seabed. Particulate aluminum was uniformly distributed in deeper waters suggesting little or no recent esuspension of bottom sediment aluminosilicates had occurred. Manganese concentration increased below 400-450 meters and exceeded aluminum concentrations. (Buchanan-Davidson--Wisconsin)
W76-08829

TRAPPING OF HEAT IN SILL FJORDS,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 5C.
W76-08856

HEATING OF ESTUARINE AND COASTAL WATERS BY NUCLEAR POWER STATIONS IN FRANCE, (ECHAUFFEMENT DES EAUX PAR DES CENTRALES NUCLEAIRES EN ESTUAIRE ET BORD DE MER EN FRANCE),
Laboratoire National d'Hydraulique, Chatou (France).
For primary bibliographic entry see Field 5B.
W76-08859

SEASONAL FEATURE OF THERMAL ABATEMENT OF SHORELINE DISCHARGES AT NUCLEAR SITES,
Bhabha Atomic Research Centre, Bombay (India). Environmental Studies Section.
For primary bibliographic entry see Field 5G.
W76-08862

DEVELOPMENT AND APPLICATION OF CRITERIA FOR MARINE COOLING WATERS,
Environmental Research Lab., Narragansett, R. I.
For primary bibliographic entry see Field 5G.
W76-08885

A STUDY OF THE INFRALITTORAL POPULATION OF THE COAST OF ROUSSILLON: III. SPATIAL AND SEASONAL VARIATIONS, (IN FRENCH),
Arago Lab., Banyuls-sur-Mer (France).
J. M. Amouroux.
Vie Milieu Ser B Oceanogr. 24(2), p 321-354, Illus, 1974.

Descriptors: Europe, Seasonal, *Aquatic populations, Density, Spatial distribution.
Identifiers: *France, Infralittoral populations, Rousillon.

The densities of populations in relation to the depth, to the distance from the coast (France) and to the season are given, as well as the indices of diversity at different bathymetric levels. The total weight and the weight per group, in relation to the depth and to the season, were also recorded. The seasonal numerical variations of the most interesting or abundant species from these bottoms are described.--Copyright 1976, Biological Abstracts, Inc.
W76-08898

ENVIRONMENTAL CONDITIONS AND PRODUCTIVITY IN THE TERMINOS LAGOON, CAMPECHE, MEXICO, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
J. R. Carvajal.
Lagena. 31, p 35-38, 1973.

Descriptors: *Lagoons, *Mexico, Seasonal, Temperature, Humidity, Salinity, Shrimp, Oysters, *Aquatic life, *Productivity.
Identifiers: Campeche, Centropomus-undecimalis, Crassostrea-virginica, Diplantherawrightii, Penaeus-setiferus, Terminos Lagoon, Thalassia-testudinum, Snook.

The lagoon can be separated into 2 zones, one characterized by clear water and abundant, submerged monocotyledons including Thalassia testudinum and Diplanthera whightii, and the other a turbid zone almost devoid of underwater plant life. Data on seasonal variations in air temperature and humidity, salinity, depth and clearness of water are provided. Shrimp (Penaeus setiferus), oysters (Crassostrea virginica) and snook (Centropomus undecimalis) are most important to the fishing industry.--Copyright 1976, Biological Abstracts, Inc.
W76-08900

POTENTIAL EFFECTS OF OIL DRILLING AND DUMPING ACTIVITIES ON MARINE BIOTA,
North Carolina Univ. at Wilmington. Inst. of Marine Biomedical Research.
For primary bibliographic entry see Field 5C.
W76-08907

ENVIRONMENTAL IMPLICATIONS OF SEDIMENT BULK ANALYSIS TECHNIQUES FOR TRACE METALS IN OFFSHORE WELL-DRILLING OPERATIONS,
Gulf South Research Inst., New Orleans, La. Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W76-08908

EFFECTS OF DRILLING OPERATIONS ON THE MARINE ENVIRONMENT,
Exxon Co., Houston, Tex.
For primary bibliographic entry see Field 5G.
W76-08909

DISPOSAL OF DRILLING FLUIDS AND DRILLED-UP SOLIDS IN OFFSHORE DRILLING OPERATIONS,
Texas A and M Univ., College Station. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 5D.
W76-08915

NOTES ON THE IMPORTANCE OF DISSOLVED AND PARTICULATE ORGANIC MATTER IN MARINE FOOD CHAINS, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-08916

RESPONSIBILITIES OF OFFSHORE DRILLING REGULATIONS,
Geological Survey, Metairie, La.
For primary bibliographic entry see Field 5G.
W76-08918

REGULATION OF ONSHORE AND OFFSHORE OIL FIELD WASTE DISPOSAL,
Texas Railroad Commission, Austin, Tex.
For primary bibliographic entry see Field 5E.
W76-08919

RESEARCH ON THE MARINE FOOD CHAIN.
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08935

PHYSIOLOGICAL ECOLOGY OF GONYAULAX POLYEDRA, A RED WATER DINOFLAGELLATE OFF SOUTHERN CALIFORNIA,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08936

TWO BLOOMS OF GYMNODINIUM SPLENDENS (LEBOUR). A LARGE NAKED DINOFLAGELLATE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08937

PHOSPHATE UTILIZATION BY AN OCEANIC DIATOM IN PHOSPHORUS-LIMITED CHEMOSTAT CULTURE AND IN THE OLIGOTROPHIC WATERS OF THE CENTRAL NORTH PACIFIC,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08938

DYNAMICS OF PHOSPHORUS CYCLING IN THE EUPHOTIC WATERS OF THE CENTRAL NORTH PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08939

PHOTOSYNTHETIC MEASUREMENTS IN THE CENTRAL NORTH PACIFIC: THE DARK LOSS OF CARBON IN 24-HOUR INCUBATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08940

SILICIC ACID UPTAKE AND INCORPORATION BY NATURAL MARINE PHYTOPLANKTON POPULATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08941

PRIMARY PRODUCTION AND THE FACTORS CONTROLLING PHYTOPLANKTON GROWTH IN THE ANTARCTIC SEAS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08942

DISTRIBUTION, MORPHOMETRY, AND SEASONAL BIOLOGY OF THE PLANKTONIC COPEPODS, NEOCALANUS ROBUSTIOR AND N. GRACILIS, IN THE PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08951

COCCOLITH SEDIMENTATION BY FECAL PELLETS: LABORATORY EXPERIMENTS AND FIELD OBSERVATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08954

AMINO ACID UPTAKE AND RESPIRATION BY MARINE HETEROTROPHS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08955

IMPROVED METHODOLOGY FOR ATP DETERMINATION IN MARINE ENVIRONMENTS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08958

COPEPOD SLICK IN THE NORTHWEST PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08959

CRUISE SUMMARY, A. SOUTHERN CALIFORNIA BIGHT STUDIES (SCBS).
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08960

CRUISE SUMMARY, B. GULF OF CALIFORNIA PHOTOBIOLOGY CRUISE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08961

PUBLIC OPINION AND THE ENVIRONMENT: ECOLOGY, THE COASTAL ZONE, AND PUBLIC POLICY,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 6G.
W76-09035

INVESTIGATIONS ON THE PHYTOPLANKTON AND SOME ENVIRONMENTAL PARAMETERS OF THE SHATTAL-ARAB (IRAQ), (IN GERMAN)
Rostock Univ. (East Germany). Dept. of Biology.
V. Kell, and A. H. Saad.
Int Rev Gesamten Hydrobiol. 60(3), p 409-421, 1975.

Descriptors: *Phytoplankton, Environment, Asia, Cyanophyta, *Algae, *Diatoms, Temperature, Dissolved oxygen, Chlorides, Chlorophyta, *Marine algae, *Estuaries.
Identifiers: *Iraq(Shatt-Al-Arab), *Tigris-Euphrates estuaries.

Samples of phytoplankton were taken from the Euphrates and Tigris estuaries (Shatt al-Arab) in April 1974 and investigated with the inverted microscope. Among 226 spp. identified in the samples, 96 were of marine origin. The percentage of diatoms in the total numbers of cells from all stations was 68%. The planktonic green algae comprised 195; the blue-greens 13%. The number of marine species continuously increased in the longitudinal axis of the 139 km section considered. The phytoplankton were compared to the gradients of some environmental variabLe (temperature, transparency, dissolved 02, Cl). Regular longitudinal or vertical differences of these parameters were not observed.--Copyright 1976, Biological Abstracts, Inc.
W76-09084

INTERACTIVE EFFECTS OF PREDATION PRESSURE AND INSECTICIDE (TEMEFOS) TOXICITY ON POPULATIONS OF THE MARSH FIDDLER CRAB UCA PUGNAX,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Entomology and Economic Zoology.
For primary bibliographic entry see Field 5C.
W76-09114

FIELD EVALUATION OF BENZOPYRENE HYDROXYLASE INDUCTION AS A MONITOR FOR MARINE PETROLEUM POLLUTION,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 5A.
W76-09116

RESPONSES OF ARCTIC MARINE CRUSTACEANS TO CRUDE OIL AND OIL-TAINTED FOOD,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
For primary bibliographic entry see Field 5C.
W76-09123

ACCLIMATION OF RAINBOW TROUT TO SEA WATER,
Dunstaffnage Marine Research Lab., Oban (Scotland).
P. J. Landless.
Aquaculture, Vol. 7, p 173-179, 1976. 3 fig. 15 ref.

Descriptors: *Aquaculture, *Salinity, *Sea water, *Fish farming, *Rainbow trout, *Mortality, *Juvenile fish, Aquatic productivity, Fish hatcheries, Fish management, Sport fish, Salmonids, Anadromous fish, Fish physiology, Methodology, Fry.
Identifiers: *Acclimation, *Osmotic stress.

The ability of rainbow trout to acclimate to sea water was evaluated in both a recirculation experiment which allowed gradual increase in salinity, and or direct transfer from fresh to sea water. Mortality occurred in fish when salinity was increased above 24.2 ppt, but not below, in the recirculating experiments. Similar results were observed in the sea cages. This allows the advantageous transfer of young rainbow trout to seawater of reduced salinity at a young age. Rainbow trout of 15 g held in sea cages at a salinity of 22 ppt had mortality levels of 1 to 8%. (Katz)
W76-09125

RESILIENCE OF A ROCKY INTERTIDAL FISH COMMUNITY IN A PHYSICALLY UNSTABLE ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 5C.
W76-09126

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1974 IN DADE COUNTY FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-09135

SEDIMENT TRANSPORT, TURBIDITY, CHANNEL CONFIGURATION, AND POSSIBLE EFFECTS OF IMPOUNDMENT OF THE MAD RIVER, HUMBOLDT COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-09136

MACROSCOPIC BENTHIC FAUNA OF THREE TIDAL CREEKS ADJOINING THE RHODE RIVER, MARYLAND,
Geological Survey, Edgewater, Md.
For primary bibliographic entry see Field 5B.
W76-09143

A NEW STRATIFIED PLANKTON SAMPLER FOR SHALLOW WATERS, (IN SPANISH),
La Plata Univ. (Argentina). Instituto del Museo.
For primary bibliographic entry see Field 7B.
W76-09193

IDENTIFICATION OF NITROGEN AS A GROWTH-LIMITING NUTRIENT IN WASTEWATERS AND COASTAL MARINE WATERS THROUGH CONTINUOUS CULTURE ALGAL ASSAYS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-09195

PHOTOGRAPHIC ANALYSIS OF WATER QUALITY CHANGES,
Georgia Univ., Athens.
For primary bibliographic entry see Field 5A.
W76-09199

POSSIBLE INFLUENCE OF ATMOSPHERIC TRANSPORT ON THE TOTAL MERCURY CONTENT OF SOUTHEASTERN ATLANTIC CONTINENTAL SHELF SURFACE WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W76-09224

THE REPLICATION OF BIOLOGICAL EVENTS IN ENCLOSED WATER COLUMNS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-09226

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, MISSISSIPPI.
Available from the National Technical Information Service, Springfield, Va 22161 as COM-73 11269, $11.75 in paper copy, $2.25 in microfiche.
Gulf Coast Research Laboratory, Ocean Springs, Mississippi, 1973. 435 p. Christmas, J.Y., editor.

Descriptors: *Mississippi, *Estuaries, *Coasts, Bays, Rivers, Tidal waters, Benthos, Vegetation, Nutrients, Salinity, Water quality, Sedimentation, Sediments, Sedimentology, Barrier islands, Beaches, Biology, Aquatic life, Zooplankton, Aquatic plants, Fish, Fisheries, Sampling, Hydrology, Oceanography.
Identifiers: *Mississippi Sound.

That portion of the Gulf of Mexico coast within the State of Mississippi was studied in considerable detail. The results of these studies were reported by papers for each of the four phases of the

study: (1) Area Description, (2) Hydrology, (3) Sedimentology, and (4) Biology. The biology phase included papers under these headings: (1) The Marshes of Mississippi, (2) The Distribution of Certain Submerged Plants in Mississippi and Adjacent Waters, (3) Estuarine Zooplankton, Mississippi, (4) Estuarine Invertebrates, Mississippi, and (5) Estuarine Vertebrates, Mississippi. (See W76-09239 thru W76-09242) (Sims-ISWS)
W76-09238

PHASE I: AREA DESCRIPTION,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
J. Y. Christmas.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi; Mississippi Marine Conservation Commission, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, p 1-71, 1973. 16 fig, 32 tab, 125 ref.

Descriptors: *Mississippi, *Coasts, *Estuaries, Bays, Tidal waters, Geology, Environment, Estuarine environment, Benthos, Economics, Land use, Fisheries, Commercial fishing, Sport fishing, Pollutants, Fishkill, Wetlands, Water pollution, Tourism, Vegetation, Surface waters, Climatology.
Identifiers: *Mississippi Sound.

Data for the Area Description Phase of the Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi were compiled and discussed. Extreme variations in many environmental factors were noted. Through most of its history, development of the Mississippi coastal area has depended on the harvesting of renewable resources from the forest and the sea, water transportation and the aesthetic attraction for visitors. In recent years intensive industrialization and large government installations have provided for phenomenal population and economic growth in a narrow strip along the coast. Realization of planned developments will create a single megalopolis extending across the state. Important segments of the coastal economy, especially the commercial fisheries and a large part of the tourist industry, and the continued wellbeing of the people depend on continued high production of renewable marine resources. The environment in most of the study area is still healthy. Domestic and industrial pollution have exceeded the assimilative capacity of some estuarine areas. Plans for abatement can provide for satisfactory recovery of most of these, at present, grossly polluted areas. It is unlikely that even fish and wildlife criteria, let alone recreation or shellfish, can be met in Mississippi estuaries if projected population and industrial developments occur without improved treatment technology. (See also W76-09238) (Sims-ISWS)
W76-09239

PHASE II: HYDROLOGY,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
J. Y. Christmas, and C. K. Eleuterius.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi; Mississippi Marine Conservation Commission, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, p 73-121, 1973. 26 fig, 5 tab, 15 ref, 1 append.

Descriptors: *Mississippi, *Estuaries, *Hydrology, *Water quality, Streamflow, Rivers, Bays, Sampling, On-site data collections, Salinity, Temperature, Nitrates, Phosphates, Nutrients, Dissolved oxygen, Hydrogen ion concentration, Oceanography.
Identifiers: *Mississippi Sound.

Salinity, temperature, pH and dissolved oxygen concentration were measured at 5-foot intervals through the water column at 51 stations in Mississippi inshore estuarine waters. Micronutrient concentrations were determined from surface and bottom water samples. Monthly stream flow was documented. Sampling was accomplished monthly or oftener. Salinity was closely correlated with stream flow, providing drastic seasonal and areal variations. Temperature followed a seasonal pattern with spring and fall reversal of offshore clines. Saltwater wedges were described. Average isohalines and isotherms for Mississippi Sound were constructed. General micronutrient levels in the study area were established. Concentrations were closely related to adjacent human population density. (See also W76-09238) (Sims-ISWS)
W76-09240

PHASE III: SEDIMENTOLOGY,
Gulf Coast Research Lab., Ocean Springs, Miss.
E. G. Otvos.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi; Mississippi Marine Conservation Commission, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, p 123-137, 1973. 3 fig, 1 tab, 15 ref.

Descriptors: *Mississippi, *Estuaries, *Coasts, *Sedimentology, Sediments, Sedimentation, Erosion, Bays, Rivers, Sands, Clays, Gravels, Particle size, Barrier islands, Beaches.
Identifiers: *Mississippi Sound.

The source of sediments in Mississippi coastal waters lies in the Eastern Gulf Province. Clayey silty sediments from the rivers settle partially in the embayments, reach into Mississippi Sound and eventually the open Gulf of Mexico. Most of the barrier island sediments are supplied by the westward littoral drift which originates on the mainland east of Mobile Point. Orthoquartzitic sands in the study area include a suite of heavy minerals typical of the Eastern Gulf Province. Clay minerals are principally kaolinite with a steady westward increase in montmorillonite + illite/kaolinite ratios caused by the Mississippi River deposits at the western end of Mississippi Sound. Size distribution patterns showed that silt and clay muds dominate much of the central portion of Mississippi Sound, grading into fine and very fine sands in several areas. Mainland beach sands west of the Pascagoula River and along the barrier island chain are medium and coarse. Minor seasonal variations were noted and accounted for. Natural phenomena continually alter the distribution patterns of bottom sediments and the included fauna. Major abrupt changes occur when storms, particularly hurricanes, reach the coast. Channel dredging and other engineering operations dislocate considerable quantities of bottom sediment. Numerous spoil areas have been altered drastically. (See also W76-09238) (Sims-ISWS)
W76-09241

PHASE IV: BIOLOGY,
Gulf Coast Research Lab., Ocean Springs. Miss. Fisheries Section.
J. Y. Christmas, L. N. Eleuterius, W. W. Langley, H. M. Perry, and R. S. Waller.
In: Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi; Mississippi Marine Conservation Commission, Gulf Coast Research Laboratory, Ocean Springs, Mississippi, p 139-434, 1973. 58 fig, 115 tab, 444 ref, 1 append.

Descriptors: *Mississippi, *Biology, *Estuaries, *Marshes, Coasts, Barrier islands, Wetlands, Plant populations, Aquatic plants, Zooplankton, Aquatic life, Invertebrates, Fish, Sampling, On-site investigations, Estuarine environment.
Identifiers: Vertebrates.

The results of the biology phase of the Cooperative Gulf of Mexico Estuarine Inventory and Study have been presented in studies of the emergent and submerged flora, the zooplankton, the vertebrate fauna, the invertebrate fauna and commercial fisheries found in the study area. Over 300 plant species, at least 100 zooplankters, 251 fishes, several other vertebrates and 180 invertebrate species were recognized. Data on the areal and seasonal distribution, associated environmental factors, life history, growth, migrations and relative abundance of many plants and animals have been presented. Species composition of commercial fishery landings were compiled from statistical data. Historical fisheries data showing the number of fisherman, craft and gear employed in Mississippi commercial fisheries were tabulated for selected years from 1930 through 1965. Relatively small areas of the Mississippi estuarine area have been seriously damaged by pollution. Continued and expanded fisheries production and utilization of unexploited resources were possible if environmental deterioration was stopped and existing conditions in some areas improved. (See also W76-09238) (Sims-ISWS)
W76-09242

FINITE ELEMENT MODEL FOR COHESIVE SEDIMENT TRANSPORT,
California Univ., Davis. Dept. of Civil Engineering.
R. Ariathurai, and R. B. Krone.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 11987, p 323-338, March 1976. 7 fig, 1 tab, 17 ref, 2 append.

Descriptors: *Sediment transport, *Cohesive soils, *Estuaries, *Finite element analysis, *Diffusion, Salinity, Clays, Flocculation, Model studies, Numerical analysis, Settling velocity, *Mathematical models.
Identifiers: *Cohesive sediment transport, Aggregation, Galerkin method.

A mathematical model that simulates erosion, transport and deposition of cohesive sediments in estuaries was developed. Due to the relatively low flow velocities prevalent in most rivers where they enter estuaries, a large portion of the total sediment load is usually composed of suspended silt and clay. The mode of cohesive sediment transport and the factors affecting the resistance of a cohesive bed to erosion by flowing water were explained. The equations governing the cohesive sediment transport were solved by the finite element method using the Galerkin formulation. The domain was subdivided into a series of triangular elements in which a quadratic approximation was made for the suspended sediment concentration. Continuing aggregation was accounted for by specifying appropriate settling velocities in each element for each time step. A table of salinities at which each of the three main clay types becomes cohesive has been included. This is useful in predicting potential aggregation as suspended sediments move from fresh to saline waters. (Singh-ISWS)
W76-09264

AN AUTOMATIC RELEASE INSTRUMENT WITH UNDERWATER BUOY FOR MARKING OF FIELD EQUIPMENT,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 7B.
W76-09268

PREDICTION OF METEOROLOGICAL FACTORS RELATED TO BEACH EROSION AT NEW JERSEY AND LONG ISLAND, N.Y.,
National Weather Service, Garden City, N.Y. Eastern Region.
S. E. Wasserman, and D. B. Gilhousen.
Journal of Applied Meteorology, Vol. 15, No. 4, p 313-318, April 1976. 3 fig, 1 tab, 5 ref.

Descriptors: *Beach erosion, *Meteorology, *New Jersey, *New York, *Atlantic Ocean, Winds, Wind velocity, Erosion, Beaches, Ocean waves, Atmospheric pressure, Meteorological data, Storms, Shores, Oceanography.
Identifiers: *Long Island(NY).

Prediction of meteorological factors related to storm-caused beach erosion were discussed. Composite sea level pressure maps were presented for beach erosion events that occurred on the New Jersey and Long Island, New York, coasts. Significant meteorological conditions related to beach erosion are: (1) an angle between the predominant wind direction on the eroding beach and the orientation of the smoothed coastline of between 0 and 20 deg for Long Island, and between 20 and 40 deg for New Jersey; (2) a setup period of at least 18 h during which coastal winds do not vary more than 20 deg from the observed predominant wind direction; (3) at some time during the setup period the wind direction upstream for a distance at least 550 km does not vary more than 20 deg from the coastal wind direction; and (4) the upwind surface pressure gradient at some time during the setup period attains a value of at least 4 mb/200 km. (Sims - ISWS)
W76-09270

PHYTOPLANKTON DISTRIBUTION IN THE VICINITY OF THE PERU CURRENT NEAR 8 DEGREES S. LATITUDE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W76-09283

MINERAL RESOURCE MANAGEMENT OF THE OUTER CONTINENTAL SHELF.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6G.
W76-09306

ECOLOGICAL EFFECTS OF OFFSHORE CONSTRUCTION,
Marine Science Inst., Bayou La Batre, Ala.
For primary bibliographic entry see Field 6G.
W76-09307

REPORT ON THE HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE SPOIL DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5E.
W76-09309

FEATURES OF VARIOUS OFFSHORE STRUCTURES,
Raymond Technical Facilities, Inc., New York.
For primary bibliographic entry see Field 8A.
W76-09311

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 11-12, 1975, SAVANNAH, GEORGIA.
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
For primary bibliographic entry see Field 5G.
W76-09329

THE OCS FORGOTTEN LAND: TERRITORIAL SEA, NEARSHORE, AND ESTUARY,
Florida Dept. of Administration, Tallahassee. Div. of State Planning.
For primary bibliographic entry see Field 5G.
W76-09330

OFFSHORE PETROLEUM DRILLING AND PRODUCTION,
Exxon Co., New Orleans, La. Southeastern Div.
For primary bibliographic entry see Field 5G.
W76-09332

SIXTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 6-8, 1974, HOUSTON, TEXAS. PREPRINTS, VOLUME II,
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09333

BEACH-OFFSHORE DREDGING: SOME ENVIRONMENTAL CONSEQUENCES,
London Univ. (England).
For primary bibliographic entry see Field 5G.
W76-09335

ENVIRONMENTAL STUDIES FOR MAJOR OFFSHORE DEVELOPMENTS,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09336

APPLICATION OF GROUND-WATER FLOW THEORY TO A SUBSURFACE OIL SPILL,
Geological Survey, Menlo Park, Calif. Engineering Geology Branch.
T. L. Holzer.
Ground Water, Vol. 14, No. 3, p 138-145, May-June, 1976. 7 fig, 9 ref.

Descriptors: *Water pollution sources, Oil, *Subsurface flow, *Subsurface drainage, *Groundwater, Oil-water interfaces, Oil reservoirs, Water table, Tile drains, Resistivity.
Identifiers: *Hantush's theory, *Oil storage tanks, *Subsurface oil spill, Flow system analysis, Field investigation.

Application of Hantush's (1968) theory for the movement of a fresh-water lens in an unconsolidated saline aquifer to the movement of an oil lens in fresh water made it possible to identify the probable source area of an oil spill of unknown origin. The theory predicted that too much time had elapsed from the first detection of oil at the surface to the collection of subsurface information to make it feasible to speculate on the precise nature of the spill event. Quantitative analysis of the flow system helped in the selection of the appropriate collection system, because a lengthy cleanup period was indicated by the analysis. An attempt to delineate the subsurface extent of the oil spill with an electrical resistivity survey was only slightly successful. (Heiss-NWWA)
W76-09350

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME II.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09371

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME III.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09374

MASS TRANSPORT AND DISPERSION OFF A TIDAL INLET,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-09381

THE OFFSHORE ECOLOGY INVESTIGATION,
Gulf Universities Research Consortium, Gulfport, Miss.
For primary bibliographic entry see Field 5G.
W76-09382

NEW YORK ALTERNATIVE DUMPSITE ASSESSMENT - RECONNAISSANCE STUDY OF SURFICIAL SEDIMENTS,
National Oceanic and Atmospheric Administration, New York. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5G.
W76-09383

GEOTECHNICAL ASPECTS OF ROCK BORROW FOR LARGE BREAKWATERS,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09386

EFFECT OF OFFSHORE STRUCTURES ON SHORELINE EVOLUTION, ATLANTIC GENERATING STATION,
Army Engineers Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5G.
W76-09388

PHOTOOXIDATION AS A FACTOR IN THE ENVIRONMENTAL DISPERSAL OF CURDE OIL,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Exploration and Production Research Div.
For primary bibliographic entry see Field 5B.
W76-09389

WILSON INLET: A SEASONALLY CLOSED WESTERN AUSTRALIAN SOUTH COAST ESTUARY,
Western Australia Dept. of Fisheries and Fauna, Perth.
R. C. J. Lenanton.
West Aust Dep Fish Fauna Rep. 14, p 1-32, 1974.

Descriptors: *Estuaries, *Australia, Coasts, Fish, Seasonal, Estuarine environment.
Identifiers: *Wilson Inlet(Australia).

Considerable conflict has existed for many years between professional fishing, recreational usage and development in the west and south coast estuaries of Western Australia. One of the areas where intense conflict exists is Wilson Inlet. A preliminary description of the Wilson Inlet environment is presented, the history of netting closures in the Inlet recorded and the history of the sand bar openings and their effect on the estuarine environment discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-09390

COMPARISON OF TWO METHODS FOR DETERMINATION OF PRIMARY PRODUCTIVITY ON COASTAL WATERS OF THE GULF OF MEXICO, (IN SPANISH),
Universidad Nacional Autonoma de Mexico City. Instituto de Biologia.
For primary bibliographic entry see Field 5A.
W76-09391

DEGRADATION OF BUNKER C OIL UNDER DIFFERENT COASTAL ENVIRONMENTS OF CHEDABUCTO BAY, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia)
For primary bibliographic entry see Field 5B.
W76-09394

CHEMICAL ANALYSES OF CAMPBELL ISLAND FRESH WATER,
Auckland Univ. (New Zealand). Marine Research Lab.
For primary bibliographic entry see Field 2K.
W76-09395

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DIRECT CONTACT MULTI-STAGE FLASH DESALINATION,
Department of the Interior, Washington, D. C. Office of the Secretary.
A. L. Kohl, T. T. Shimazaki, and W. B. Suratt.
U.S. Patent No. 3,948,734, 6 p, 4 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 311, April 6, 1976.

Descriptors: *Patents, *Desalination, *Water purification, *Waste water treatment, *Desalination processes, *Desalination apparatus, Condensation, Separation techniques, Potable water, Flash distillation.

The invention provides a relatively cool and pure liquid, which is used to directly condense vapors flashed off an impure liquid in stages in which pure liquid and condensate flows from stage to stage by gravity and contacts vapor in each stage in a cross-flow 'rain' type spray zone. The direct contact condensation stages are grouped in a module containing 2 to 10 condensation chambers and condensate flows through each module by gravity and then is pumped to the top of the next module. This arrangements keeps both the module height and number of pumps within reasonable limits. The functions of brine flashing and steam condensation are separated. The condensation chambers in each module are located vertically above the brine flashing chambers, and at progressively lower elevations in the direction of condensate flow to permit gravity flow of condensate between chambers. The water vapor flows upward through a vapor duct to the corresponding condensation chamber where it flows through in crossflow relationship to a 'rain' of cooler falling water streams or droplets and is thereby condensed, raising the temperature of the total condensate stream. The flashing water is at its boiling point and substantially pure steam is evolved upon exposure to a chamber of reduced pressure and is subsequently condensed. (Sinha - OEIS)
W76-09052

PROCESS FOR ELECTROLYSIS OF BRINE,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y. (Assignee).
For primary bibliographic entry see Field 5D.
W76-09053

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3E.
W76-09065

REVERSE OSMOSIS SEPARATION OF POLAR ORGANIC COMPOUNDS IN AQUEOUS SOLUTION,
Illinois Univ. At Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-09165

WATER SUPPLY AND SEWAGE TREATMENT IN ARID AREAS,
For primary bibliographic entry see Field 5D.
W76-09166

REVERSE OSMOSIS TODAY,
For primary bibliographic entry see Field 5D.
W76-09169

3B. Water Yield Improvement

THE AVAILABILITY OF GROUND WATER FOR IRRIGATION IN THE RICE LAKE-EAU CLAIRE AREA, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 4B.
W76-09348

WATER FOR THE IVORY COAST.
For primary bibliographic entry see Field 8C.
W76-09355

3C. Use Of Water Of Impaired Quality

LEACHING LOSSES OF AMMONIUM AND NITRATE IN THE RECLAMATION OF SAND SPOILS IN CORNWALL,
Liverpool Univ. (England). Dept. of Botany.
W. S. Dancer.
Journal of Environmental Quality, Vol. 4, No. 4, p 499-504, October-December 1975. 4 fig, 3 tab, 15 ref.

Descriptors: *Leaching, *Ammonium compounds, *Ammonium salts, Fertilization, *Nitrates, *Land relamation, Nitrogen, Plant growth, Sands.
Identifiers: *Sand spoils.

Reclamation studies on sand spoils in Cornwall have shown a difficulty in maintaining adequate levels of nitrogen for plant growth. Information is presented to show that the movement of N03(-) and NH4(+) is highly correlated with rainfall (r=0.89 and 0.92, respectively). Nitrate leaching is more serious than NH4(+) leaching and calculations show that more than 98% of the N03(-) fertilizer applied to bare sand spoil will be leached beyond the surface 20 cm with an average month of summer rainfall (9.7 cm). Maximum inorganic-N fertilizer recoveries of 40 kg/ha are predicted for grass swards established on spoils flattened by earth-moving equipment, while recoveries less 20 kg N/ha are likely on steeply sloping sand heaps. (SKogerbor-Colorado State)
W76-08760

SOLUBLE SALTS AND NITRATE DISTRIBUTION IN IRRIGATED LETTUCE BEDS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
K. B. Hummadi, D. D. Fangmeir, and T. C. Tucker.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 4, p 686-689, July-August 1975. 6 ref, 2 tab, 9 ref.

Descriptors: *Irrigation, *Irrigation effects, *Salinity, *Saline soils, *Lettuce, *Nitrates, Sprinkler irrigation, Furrow irrigation, Irrigation practices, Salts, Salt tolerance, Distribution.

The salt and nitrate content was measured in lettuce beds irrigated by sprinkler, furrow and combined methods. Salt and nitrate content was determined by depth in the center, near both sides of the bed and in the furrow between beds. Furrow irrigation continually increased the salt content of the surface 2.5 cm of soil in the bed particularly in the center of the bed. Sprinkler irrigation slightly decreased the salt content during the season. Below 7.5 cm the irrigation method had little effect. (Skogerboe-Colorado State)
W76-08763

SALT TOLERANCE AND SUITABILITY OF VARIOUS GRASSES FOR SALINE ROADSIDES,
Colorado State Univ., Fort Collins. Turfgrass Extension.
T. D. Hughes, J. D. Butler, and G. D. Sanks.
Journal of Environmental Quality, Vol. 4, No. 1, p 65-68, January-March 1975. 1 fig, 6 tab, 12 ref.

Descriptors: *Salinity, *Crop response, *Saline soils, *Grasses, *Salt tolerance.
Identifiers: Saline roadsides.

Forage yields of five grass species were studied in soil under greenhouse conditions with NaCl additions of 0; 5,000; 10,000; and 20,000 ppm. Forage yield of P. distans was reduced 23% by addition of 20,000 ppm NaCl, compared to a minimum reduction of 40% for the other grass species. Mineral analysis of leaf tissue by emission spectroscopy showed that Na concentrations increased as NaCl addition to the soil increased. However, there was no relationship between salt tolerance of the various grasses and amounts of Na in leaf tissue. Increased NaCl addition to the soil resulted in decreased leaf Ca and Mg, but no relationship existed between leaf K and NaCl addition. (Skogerboe-Colorado State)
W76-08764

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W76-08840

EFFECTS OF LIME, PHOSPHATE AND SOIL CONDITIONER ON GROWTH AND FRUIT QUALITY OF NETTED MELON, (IN JAPANESE),
Tsuishin Jr. Coll. of Agriculture, Aichi (Japan).
T. Takano, and Y. Saso.
Sci Rep Fac Agric Meijo Univ. 8, p 1-10, 1972.

Descriptors: Fruit crops, *Melons, *Plant growth, *Soil amendments, Fertilizers, *Lime, *Phosphate, *Root development, Soil-water-plant relationships.

Differences in stem length between treatments were observed on about the 15th day after transplanting. This was the effect of lime, phosphate and soil conditioner on stem elongation. The growth of plants in plots treated with soil conditioner was delayed during the early stage of growth due to lower soil moisture. The main effect of lime and soil conditioner was shown by good root development, large and thick leaves, sweet fruit and higher specific gravity of fruit. No difference of fruit weight and fruit shape was observed between treatments. Fruits on plants treated with soil conditioner had longer storage life. Treatment with soil conditioner increased pore space in soils, improving water permeability. Soils after harvest had lower pH and lower exchangeable Ca, except for the plots treated with lime. Cations in soils treated with soil conditioner were leached by watering. The supply of lime and soil conditioner, separately and combined improved fruit quality.--Copyright 1974, Biological Abstracts, Inc.
W76-08989

PLANT COLLECTION FOR SALTLAND REVEGETATION AND SOIL CONSERVATION,
Western Australia Dept. of Agriculture, South Perth. Soils Div.
For primary bibliographic entry see Field 2I.
W76-09071

GROWTH, WATER CONSUMPTION, AND SALT UPTAKE OF TOMATO PLANTS IN HIGH HUMIDITY- HIGH CARBON DIOXIDE GREENHOUSE ENVIRONMENTS,
Arizona Univ., Tucson.

A. A. Swalls, and J. W. O'Leary.
Journal of the Arizona Academy of Science, Vol. 11, No. 1, p 23-26, February, 1976. 4 tab, 23 ref.

Descriptors: *Plant growth regulators, *Humidity, *Moisture uptake, *Environmental control, *Carbon dioxide, *Greenhouses, Salt tolerance, Transpiration control, Water utilization, Air environment, Plant growth, Productivity, Environmental effects, Evapotranspiration.

When tomato plants were cultivated in greenhouses under high humidity and high CO2 conditions, water consumption and salt concentrations were reduced and growth rates increased. Plants were grown in a conventional fan-pad open greenhouse and three closed-environment greenhouses maintained at 85-100% relative humidity. In the latter three greenhouses, CO2 concentrations were 300, 900, and 1500 ppm respectively. Water uptake declined due to increased humidity and CO2 levels; higher water-use efficiency was indicated by a significant decrease in transpiration ratio. Total salt concentration in the leaves declined only at higher CO2 levels; magnesium content was reduced by high humidity alone. Growth was significantly greater under these conditions than in lower CO2 environments at either high or low humidity. High humidity-induced declines in dry weight were more than offset by the increase in CO2; the stem and petiole accounted for most of the increased weight. (Jahns-Arizona)
W76-09075

SEWAGE EFFLUENT INFILTRATES FROZEN FOREST SOIL,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 5B.
W76-09288

3D. Conservation In Domestic and Municipal Use

IMPLICATIONS OF ZONING AS AN URBAN WATER MANAGEMENT MEASURE,
Georgia Univ., Athens. Dept. of Real Estate.
For primary bibliographic entry see Field 6F.
W76-08755

URBAN RUNOFF MODELLING,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Div.
For primary bibliographic entry see Field 4A.
W76-09033

DECISION PERSPECTIVES ON URBAN STORM WATER POLLUTION,
GKY and Associates, Alexandria, Va.
For primary bibliographic entry see Field 5G.
W76-09207

THE EFFECT OF ROAD DEICING SALTS ON SODIUM CONCENTRATION IN AN URBAN WATER COURSE,
York Univ., Downsview (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-09218

QUANTITATIVE ASSESSMENT OF CHANGES IN URBAN RUNOFF,
Texas Univ. Health Science Center, Houston. School of Public Health.
For primary bibliographic entry see Field 4C.
W76-09267

3E. Conservation In Industry

KINETICS AND MECHANISMS OF THE OXIDATIVE DEGRADATION OF NITRILOTRIACETIC ACID (NTA) IN AQUEOUS SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-08843

INDUSTRIAL DEVELOPMENT THROUGH WATER-RESOURCES PLANNING,
Department of Commerce, Washington, D. C.
K. L. Kollar, and R. Brewer.
Journal American Water Works Association, Vol. 67, No. 12, p 686-690, December 1975. 2 tab.

Descriptors: *River basins, *Water resources, *Planning, *Projections, *Industrial water, *Water conservation, *Water demand, *Reused water, Reclaimed water, Planning, Computer models, Water pollution control, Recycling, Chesapeake Bay.

Long range water resources planning is hampered by the lack of basic data to base judgements regarding allocating resources and competing waste requirement. Discussed is a model developed by the Department of Commerce that forecasts industrial water demands for river basins. It is keyed to economic projections developed for national and regional planning. The data base is large: the 12,000 largest water using manufacturing plants in the nation which account for 98% of such water use. The model projects withdrawal demands by industry by changing technology, variations in water pollution control requirements, and changes in recycling rates. Population growth and economic activity are in accordance with Series C projections prepared by the U.S. Water Resources Council and best available pollution control technology is assumed by 1985. Applied to Chesapeake Bay, forecasts were made for water use through the year 2020. This is broken down into items such as gross water use, intake, recycling rate, discharge, etc. Cooling water is a major use in many manufacturing processes and since it is relatively pollutant-free it may be recycled. In contrast, water used in a manufacturing process is less likely to be recyclable since it is in contact with pollutants. In the future it is expected that recycling rates will be much higher than now. This will allow considerable industrial expansion in an area such as Chesapeake Bay without significantly increasing water withdrawal. Recycling is influenced by availability and cost of water, quality, plant processes, materials recovery, consumptive losses, regulations, cost avoidance, and age of plant. (Smith-North Carolina)
W76-09034

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
L. Duckstein.
In: International Conference on Global Water Law Systems, September 1-9, 1975, Valencia, Spain, 58 p. 64 ref, 2 append.

Descriptors: *Water management(Applied), *Desalination, *Waste water treatment, *Water allocation(Policy), *Water law, Administration, Flood control, Irrigation, Water quality, Urbanization, Technology, Research and development, Electric power production, Water rights, Decision making, Systems analysis.

Both traditional and new technologies are needed to solve the fundamental problems of flood control, irrigation, effects of urbanization, and water quality. The problem of allocating ater between competing sources, especially energy production and agriculture, is acute in certain regions, such as nea: coal reserves in the western U. S. As a result of new technologies, water requirements may increase or decrease with various degrees of certainty. Desalination, which may be used as a supplementary fresh water source in conjunction with natural supplies, and several wastewater treatment schemes which may be used to increase insufficient water supply are given special consideration. In addition, systems analysis techniques themselves should be considered as new technologies. Legal systems are briefly reviewed from the viewpoint of their role in the overall water resources system and in the decision-making process. (Robinett-Arizona)
W76-09065

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN SELECTED COAL-ENERGY AREAS OF UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09148

NORTHERN GREAT PLAINS RESOURCE PROGRAM. SURFACE RESOURCE WORK GROUP--REGIONAL PROFILE.
Northern Great Plains Resource Program, Denver, Colo.
For primary bibliographic entry see Field 4C.
W76-09228

WATER RESOURCES POLICY ISSUES - 1975.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-09230

WATER REQUIREMENTS FOR ENERGY,
L. E. Wilkinson.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p. 9-21. 2 fig., 4 tab.

Descriptors: *Electric power production, *Pacific Coast region, *Water demand, Electric power demand, Rocky Mountain region, Water utilization, Coal, Nuclear power plants, Thermal powerplants, Oil shales, Oil wells, Water costs, Water supply, Planning, Natural gas, Water requirements.
Identifiers: Coal gasification plants, Coal liquifaction plants, Coal slurry pipelines, Geothermal power plants.

The burgeoning demand for energy in the Western states and the consequent pressure on their limited water resources are discussed in relation to various energy sources. Water uses for strip mine revegetation, coal slurry pipelines, coal liquefaction, coal gasification, oil shale recovery, synthetic fuels, drilling and recovery of crude oil and natural gas, geothermal energy conversion, and steam electric plants are outlined and summarized to show the pounds of water required to produce one million BTUs: A steam-electric-nuclear source 200 to 2000; steam-electric-coal 200 to 1350; coal gasification 800 to 1350; oil shale 100 to 240; and coal slurry pipelines zero to 100. The water supply in the river basins is computed for the Upper Colorado, Lower Colorado, Great Basin, Northwest, and California, in millions of acre-feet, as 9.9, 1.8, 2.6, 49 and 20, respectively. The demand on the respective basins is 4.3, 4.4, 3.4, 17, and 31; while the percent in use is 43, 250, 130, 34, and 155. (The numbers exceeding 100% are accounted for by imported water). Suggested technical alternatives are: Water conservation, technological development on dry cooling systems; cloud seeding in winter; coastal siting of steam-electric plants; and more nuclear power plants. Evaporative cooling tower installations

should be discontinued and interbasin transfers are unreliable sources. (See also W76-09230) (Auen-Wisconsin).
W76-09231

HYDROLOGICAL PROBLEMS ASSOCIATED WITH DEVELOPING GEOTHERMAL ENERGY SYSTEMS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09260

ECONOMICS AND ENERGY: REDUCING MILL ENERGY CONSUMPTION AND EFFLUENT VOLUME,
Ekono Inc., Bellevue, Wash.
For primary bibliographic entry see Field 5G.
W76-09299

STUDIES ON OXYGEN-ALKALI TREATMENT OF LIGNEOUS MATERIALS. PART V. RECYCLE AND REUSE OF WASTE LIQUOR IN O-PA-P BLEACHING SEQUENCE (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
T. Nishida, K. Sakai, and T. Kondo.
Japan Tappi, Vol. 29, No. 12, p 641-649, December, 1975. 6 fig, 9 ref, 8 tab. English summary.

Descriptors: *Water conservation, *Bleaching wastes, *Oxygen, *Recirculated water, Pollution abatement, Water pollution control, Wastes, Industrial wastes, Recycling, Water pollution sources, Pulp wastes, Color, Hydrogen ion concentration, Industrial water, *Water reuse.
Identifiers: Sodium hydroxide, Birch trees(Betula), Kraft pulp, Hydrogen peroxide, Washing(Pulp).

Birch kraft pulp was bleached by a three-stage sequence using oxygen-alkali, peracetic acid, and hydrogen peroxide (O-PA-P), followed by countercurrent washing. Pulp brightness could be maintained at 90 without any effluent during at least 10 recycles of the spent bleach liquor, provided the pH values of the oxygen and peroxide bleach liquors were kept constant by NaOH additions. The freshwater consumption was estimated at about 5 cu m/ton of pulp, but this required 1.5% of additional NaOH in the oxygen stage (based on oven-dry pulp). The NaOH addition could be omitted by increasing the freshwater volume to 10 cu m/ton of pulp, but this increased the evaporator load. Compared to a conventional O-D-E-D sequence, countercurrent washing reduced the total effluent color to 1/9 or 1/10 and the total effluent COD to 1/8 or 1/9 after 10 recycles. (Brown-IPC)
W76-09337

PAPETERIES DE L'AA -- SUSPENDED SOLIDS REDUCED BY 98%, ORGANIC MATERIALS BY 74% (PAPETERIES DE 1'AA -- MES REDUITES DE 98%, ET MO DE 74%),
For primary bibliographic entry see Field 5D.
W76-09341

CLOSING THE WHITE WATER SYSTEM OF PAPER MACHINES -- EFFECTIVE PROTECTION OF THE ENVIRONMENT (FECHAMENTO DO SISTEMA DE AGUA BRANCA DAS MAQUINAS DE PAPEL -- UMA POTECAO LUCRATIVA DO MEIO AMBIENTE),
C. Johansson.
O Papel, Vol. 36, p 103-109, November, 1975. 4 fig, 9 tab.

Descriptors: *Closed conduit flow, *Water conservation, *Recirculated water, Water pollution control, Recycling, water reuse, Water consumption (except consumptive use), Foreign countries, Costs, Effluents, Pollution abatement, Europe.
Identifiers: *Paper machines, *White water(Paper machines), Kraft mills, Tissue mills, *Sweden, Fiber recovery.

Following an introduction to data on average specific water consumption and specific dry solids losses during the manufacture of various types of paper with open white water systems, experience with closed white water systems at a Swedish integrated kraft mill and at a Swedish tissue paper mill is described. In these cases, effluent flow was reduced by up to 84%. Cost figures show that savings relating to fiber recovery and reduced pollution load can render such a closing of the white water system very profitable. (Speckhard-IPC)
W76-09342

3F. Conservation In Agriculture

NO-TILL SEEDING OF IRRIGATED SORGHUM DOUBLE CROPPED AFTER WHEAT,
Southwestern Great Plains Research Center, Bushland, Tex.
R. R. Allen, J. T. Musick, F. O. Wook, and D. A. Dusek.
Transactions of the ASAC (American Society of Agriculture Engineers) Vol 13 No. 6, p 1109-1113, November-December 1975. 7 fig, 3 tab, 8 ref.

Descriptors: *Sorghum, Till, Seed treatment, Irrigation, Wheat, Crop response, Agriculture, Crop production, Great Plains, Cultivation.
Identifiers: *Non-tillage practices, Southern High Plains.

Irrigated grain sorghum was successfully no-till seeded into wheat residue immediately following wheat harvest in the Southern High Plains. Also Grain sorghum was grown with clean tillage and seeding for comparison. No-till seedlings generally emerged faster, grew taller, and matured up to 5 days earlier than controls. Grain yield for a 5-yr study averaged 5,690 kg/ha for no-till and 5,070 kg/ha for clean-till, a 12 percent increase. No-till required only one-fifth as much time between crops to prepare and plant a seedbed. No-till reduced fuel requirements, including harvest, by 55 percent. (Skogerboe-Colorado State)
W76-08756

WATER REGIME IN GROWING POINTS OF WHEAT SHOOTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 2I.
W76-08757

EFFECT OF LATE SOWING ON MORPHOGENETIC DEVELOPMENT OF PANICLE IN RICE (ORYZA SATIVA L.),
Calcutta Univ. (India). Dept. of Agriculture.
R. M. Datta, A. K. Paul, and N. Mondal.
Indian J Agric Sci. 42(9), p 795-799, 1972.

Descriptors: *Rice, Crops, Cereal crops, Field-crops, *Planting management, *Seasonal, *Plant growth.
Identifiers: *Late sowing.

Floral initiation, panicle development and heading were studied in the summer and winter varieties of O. Sativa, sown late in the monsoon. In sumer rice, the tissue from floral initiation was differentiated earlier, spikelets and glumes developed quickly, meiosis took place rapidly and heading was completed 8 days earlier. In winter all the stages were noticed earlier in summer rice, indicating its relative insensitivity to important environmental factors like day length, temperature and humidity which make it a short duration crop. No unusual behavior, at least in floral initiation and panicle development was noticed. Winter rice revealed its characteristic short-day response to floral initiation and subsequent morphogenetic development despite sowing in winter. Floral morphogenetic initiation was noted first in summer rice and last in spring rice, although spring rice was more suited to the environmental conditions in late winter and spring. The morphogenetic development, particularly during the stages from floral initiation to heading, is governed by humidity in spring rice. Humidity may act as a limiting factor even under optimum conditions of temperature and light. In spite of floral initiation and panicle development, pollen sterility was found in winter and summer rices more than in spring rice. This sterility is probably physiological. Spring rice, being winter-adapted, showed the minimum grain sterility.--Copyright 1974, Biological Abstracts, Inc.
W76-08758

A SIMULATION MODEL OF BIOPHYSIOCHEMICAL TRANSFORMATIONS OF NITROGEN IN TILE-DRAINED CORN BELT SOIL,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 5B.
W76-08761

NATURAL (15)N ABUNDANCE IN SOIL, LEAVES, AND GRAIN AS INFLUENCED BY LONG TERM ADDITIONS OF FERTILIZER N AT SEVERAL RATES,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
V. W. Meints, L. V. Boone, and L. T. Kurtz.
Journal of Environmental Quality, Vol. 4 No. 4, p 486-490, October-December 1975. 4 fig, 1 tab, 20 ref.

Descriptors: *Fertilization, *Fertilizers, *Nitrogen, *Corn(Field), *Soybeans, Crop response, Soils, Leaves, Grains(Crops).

Soil, leaf, and grain natural (15)N abundance was measured in corn and soybean plots which had received various rates of fertilizer N for 20 years. Soil (15)N abundance did not significantly reflect the amount of fertilizer N applied and should not be used to estimate fertilizer N additions. Corn leaf and grain (15)N abundance reflected additions of fertilizer N only at low rates of fertilizer N applied. Soybean leaf (15)N abundance reflected a decrease in symbiotic N fixation with additional increments of fertilizer N applied. (Skogerboe-Colorado State)
W76-08765

POTENTIALLY BENEFICIAL USES OF SULFURIC ACID IN SOUTHWESTERN AGRICULTURE,
Arizona Univ. Tucson. Dept. of Soils, Water and Engineering.
S. Miyamoto, J. Ryan, and J. L. Stroehlein.
Journal of Environmental Quality, Vol. 4, No. 4, p 431-437, October-December 1975. 63 ref.

Descriptors: *Acids, Waste disposal, Land reclamation, Sodium, Agriculture, *Southwest U.S., Industrial production, Beneficial use, Soil amendment, Soil treatment.
Identifiers: *Sulfuric acid, Water amendment.

Production of sulfuric acid is projected to exceed market demand in the southwestern USA if current air pollution control regulations are fully implemented by means of acid plants. Considerable quantities of surplus acid can be used beneficially for reclaiming sodium-affected calcareous soils, increasing the availability of phosphorus and certain micronutrients, treating alkaline and ammoniated irrigation water, controlling certain weeds and soil-borne pathogens, improving range grass establishment and growth, and for several other purposes. Principles involved in these uses are reasonably well established, but studies are required to determine effective use especially in

the area of field application. (Skogerboe-Colorado State)
W76-08766

POWER FACTORS AND ELECTRICAL DEMANDS OF CENTER-PIVOT IRRIGATION MACHINES,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
L. E. Stetson, and S. O. Nelson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No. 4, p 673-676, July-August, 1975. 4 fig, 2 tab, 3 ref.

Descriptors: *Irrigation effects, *Electric power demand, *Electric power costs, Irrigation practices, Irrigation, Irrigation system.
Identifiers: *Center pivot irrigation.

Some operating characteristics of electrically driven, center-pivot irrigation machines were measured in the field. Peak power demands over fractional-minute periods were about twice the average demand. Power factors for the machines ranged between 0.3 and 0.5, and at least 1 kVA per connected hp was necessary to meet average electrical demands. Higher average power was required for faster rates of travel, but peak power demand was independent of travel rate. Power required for movement of machines around the pivot was the same whether or not they were carrying irrigation water. Voltage drops in drive-motor circuits did not exceed the tolerance limits for the 460-V motors and controllers. (Skogerboe-Colorado State)
W76-08770

SOIL AND WATER CONSERVATION WITH WESTERN IOWA TILLAGE SYSTEMS,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
For primary bibliographic entry see Field 4D.
W76-08805

AGRICULTURAL WATER DEMANDS IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. S. Sowell, R. E. Sneed, and L. H. Chen.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-253 771, $9.25 in paper copy, $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No. 114, May 1976. 262 p, 43 fig, 64 tab, 11 ref, 3 append. OWRT B-068-NC(2), 14-31-0001-4113.

Descriptors: *Agriculture, *Water demand, *Water utilization, *North Carolina, *Irrigation water, *Water requirements, Irrigation, Irrigation practices, Computer models, Linear programming, Irrigation efficiency, Model studies, Optimization.
Identifiers: *Agricultural water demand, Water use model, Irrigation policy, *Tar-Neuse River Basin(NC).

The objectives were: (1) to determine total water requirements for a given level of agricultural activity in an area; (2) to determine for a given level of water available in a specified area, the optimum level of agricultural activity; and (3) to determine economically feasible irrigation water requirements for each crop grown in an area. A linear programming optimization model was developed to rapidly analyze large numbers of irrigation-soil type-crop combinations. Water requirements for twenty-six counties in the Tar-Neuse River Basin were evaluated for 1971 rainfall conditions. Total water requirements, peak water requirements and the time of the peak requirement, and dollar value of the production were determined for four levels of irrigation. In addition, similar information was developed for three of the counties over a ten-year period, based on rainfall data from 1961 to 1970. This report covers Phase III of the study. (See also W74-01112) (Stewart - North Carolina State)
W76-08841

IMPACT OF CHANGES IN IRRIGATION WATER MANAGEMENT IN EASTERN IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
C. E. Brockway, and B. A. Claiborn.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 965, $4.50 in paper copy, $2.25 in microfiche. Idaho Water Resource Research Institute, Moscow, Completion Report June 1975. 50 p, 4 fig, 16 tab, 46 ref. OWRT A-040-IDA(1), 14-34-0001-5012.

Descriptors: Irrigation districts, *Irrigation efficiency, Sprinkler irrigation, Surface irrigation, Irrigation practices, Distribution systems, *Canal seepage, *Idaho, *Water management(Applied), Irrigation water, *Water utilization, Diversion, Return flow, Seepage, Consumptive use.
Identifiers: Snake River Basin(Idaho), Upper Snake River Region(Idaho).

Irrigation water use data on six irrigation districts in the Upper Snake River Basin of Idaho were obtained for the 1974 season. Data on river diversions, return flows, crop consumptive use, and seepage losses were obtained and water budget analysis performed to determine present farm, conveyance system and project efficiencies. Present farm irrigation efficiencies varied from 11 to 62 percent and project irrigation efficiencies varied from 10 to 42 percent. Low farm irrigation efficiencies were attributed to long field runs on high intake rate soils. Canal seepage losses contribute a significant part of the system loss; however, lining of main canal systems would not significantly increase project efficiencies. Reasonably attainable project efficiencies were determined by evaluating the effects of reducing canal seepage losses, incremental reductions in river diversions, reasonable increases in farm irrigation efficiencies, and a complete hypothetical conversion to sprinkler irrigation. Reasonably attainable project efficiencies of 35 to 51 percent are estimated assuming a farm irrigation efficiency of 60 percent which is achievable with sprinkler irrigation or well managed surface systems. On the six districts evaluated, which irrigate 252,000 acres, a potential water savings of over 800,000 acre feet per year could be achieved making water available for irrigation of an additional 274,000 acres or for other beneficial uses.
W76-08925

ZINC NUTRITION OF RICE IN RELATION TO IRON AND MANGANESE UPTAKE UNDER DIFFERENT WATER REGIMES,
Govind Ballabh Pant Univ. of Agriculture and Technology, Pantnagar (India).
M. S. Gangwar, and J. S. Mann.
Indian J Agric Sci. 42(11); p 1032-1035, 1972.

Descriptors: *Rice, *Zinc, Iron, Manganese, *Water requirements, *Soil-water-plant relationships, Plant diseases, Flooding, Irrigation, Plant growth, *Absorption.
Identifiers: India, Oryza-Sativa, Khaira.

A greenhouse study was conducted on a silty clay-loam soil to investigate the influence of soil moisture regimes and Zc application on the Fe and Mg uptake by 'IR 8' rice (oryza sativa L.) and its growth pattern. When compared with irrigation to field capacity, flooding produced more dry matter at all stages of growth. Generally, Zn application increased the dry matter significantly under flooding condition and marginally under irrigation to field capacity. Flooding remarkably increased the Fe and Mg content, and to a lesser extent Zn content, of the different plant parts. Zc application markedly decreased the Fe and Mg concentration in plants under both water regimes. 'Khaira' disease of rice in the tarai (subhumid and submontane belt at the foot of the Himalayas) region may be due to Fe- and Mg-induced Zc deficiency.--Copyright 1974, Biological Abstracts, Inc.
W76-08974

INTERCEPTION OF RAINFALL AT DIFFERENT GROWTH STAGES BY THE CANOPY OF TOBACCO PLANTS, (IN JAPANESE).
Okayama Tobacco Experiment Station (Japan).
H. Kitanosono.
Proc Crop Sci Soc Jap. 41(1); p p 38-43, 1972.

Descriptors: *Rainfall, *Tobacco, *Plant growth, *Raindrops, *Interception, Canopy, Stem-flow, Throughfall, Cover crops, Analytical techniques.
Identifiers: *Bright yellow.

Bright Yellow was used in this experiment. The rainfall intercepted by the tobacco canopy is redistributed as throughfall, stalk-flow, evaporation and absorption. The shaded area by the canopy was measured quantitatively by the use of photographs and a planimeter. The number and size of raindrops were measured by photographic paper spread with developer. There was a high degree of positive correlation between the raindrop diameter and the size of the trace of photographic paper. The number of raindrops/sec counted on the shaded area was 282 at moulding time, 527 at topping time. The dissolution of raindrops due to the collision with the leaf surface differed by the position on the leaf inclination angle of leaf, condition of surface and collision angle between drops and leaf. Photographs showed that when a drop of water (diameter 4.1 mm) fell from the height of 11 m and hit the surface of the leaf, it was divided into many microdroplets with the diameter of the largest droplet about 2.0 mm. Interception increased directly with the growth of vegetative cover and the distribution of ground rainfall was influenced by the character of vegetative growth. The amount of water held by the leaf after rainfall was about 50 g/plant at the budding stage and this water was absorbed by the leaf or evaporated into the atmosphere after about 50 min. The amount of stem-flow was smaller than that reaching the ground directly through canopy gaps or from leaf drip. About 1/3 of the water held by leaf flowed down from the tip and about 2/3 flowed down the basal part of the leaf. Excessive rainfall was deleterious to leaf quality of flue-cured tobacco.--Copyright 1974, Biological Abstracts, Inc.
W76-08986

EFFECT OF SOIL-MOISTURE REGIMES AND N AND P FERTILIZATION ON BERSEEM GROWN FOR FODDER,
Indian Agricultural Research Inst., New Delhi. Div. of Agronomy.
S. P. Singh, and R. R. Singh.
Indian J Agric Sci. 42(9); p 819-822, 1972.

Descriptors: *Soil-water-plant relationships, *Soil moisture, *Fertilizers, Irrigation, Sands, Loam, Nitrogen, Phosphorus, Potassium, *Plant growth.
Identifiers: *Berseem, *Fodder, Trifolium-Alexandrinum, India.

A field experiment on berseem (Trifolium alexandrinum Juslen.) with 3 levels of soil moisture regimes (irrigations at 75, 50 and 25% available soil moisture), N (0, 20 and 40 kg/haas urea) and P (0, 40 and 80 kg P2O5/ha as single superphosphate) each, was conducted in Agra, India, during the winter seasons of 1966-67 and 1967-68. The soil was a sandy-loam, deficient in N and P and rich in K. The maximum yields of green and dry fodder were obtained under wet soil moisture regimes. The responses to N and P applications were linear for the yield of green as well as dry fodder. Application of 40 kg N along with 80 kg P2O5/ha gave the highest yield of green fodder.--Copyright 1974, Biological Abstracts, Inc.
W76-08987

PRESSURE AND FLOW REGULATION DEVICE,
Rain Bird Sprinkler Mfg. Corp., Glendora, Calif. (Assignee).
C. J. Flynn.
U. S. Patent No. 3,948,285, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 167, April 6, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation systems, *Irrigation efficiency, Flow, Flow control, Pressure, Water delivery, Water distribution(Applied).

A device is described in which each sprinkler in the system has an independently pressure-regulated supply, and has its own pressure-actuated check valve to prevent undesirable low-pressure flow. A check valve with a resiliently mounted diaphragm snaps the valve open positively when a predetermined minimum supply pressure is reached, and, constructed integrally with the check valve so as to form a single interrelated device is a pressure regulating disk cooperating with the check valve diaphragm to provide a constant pressure source of water to the associated sprinkler. The diaphragm of the check valve is exposed to the water supply pressure on one side and to atmospheric pressure in a vented chamber on its other side. The invention represents a significant advance over previous devices because it provides the dual functions of a pressure regulator and a check valve in a single device. (Sinha-OEIS)
W76-09049

METHOD AND DEVICE FOR ATTACHING SHUT-OFF CONTROL VALVE TO DISTRIBUTING WATER PIPE SUCH AS SERVICE PIPE WITHOUT STOPPING PASSAGE OF WATER THERETHROUGH,
Yano Giken Co., Ltd. Osaka (Japan). (Assignee).
M. Yano.
U. S. Patent No. 3,948,282, 4 p, 11 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 166, April 6, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation operation and maintenance, Irrigation efficiency, *Irrigation systems, Irrigation practices, Pipes, Water delivery, Flow control.

When a portion of a distributing water pipe has become cracked or otherwise damaged, the invention provides for the installation of a water control valve adjacent to or the installation of water control valves on both sides of the cracked area of the pipe without stopping passage of water. A T-pipe is attached to the damaged water distribution pipe. A first valve assembly is then mounted on the T-pipe assembly. A hole boring assembly is mounted on the free end of the first valve assembly in watertight relation and a hole then bored in to the water distribution pipe. The hole is closed by the first valve member after which the boring assembly is withdrawn. A second valve assembly having an external housing is mounted to the free end of the first valve assembly by means of the external housing and the valve seat of the second valve housing then inserted through the opening and the water distribution pipe locked in place to shut off the flow of water through either distribution pipe. The external housing is thereafter removed. (Sinha-OEIS)
W76-09050

COST OF PRODUCING CROPS IN THE IRRIGATED SOUTHWEST, PART V: UTAH,
Arizona Univ., Tucson.
N. G. Wright, L. H. Davis, T. M. Stubblefield, and D. A. Swope.
Arizona Agricultural Experiment Station, Technical Bulletin 223. 1976. 25 p, 1 fig, 25 tab, 25 append.

Descriptors: *Cost analysis, Water resources development, *Crop production, *Cultivated lands, *Irrigated land, *Planning, Economic feasibility, Cost comparisons, Water utilization, Land development, Agriculture, Irrigation programs, *Utah, Marketing, *Southwest U. S.
Identifiers: Synthetic budgeting method.

This study is part of a project designed to supply information necessary to maximize the agricultural base in southwestern states and to aid realistic planning of profitable agri-businesses using irrigated land. Some southwestern states are now under irrigated cultivation and use; additional acreages could be irrigated wherever such utilization would have economic advantages over alternative uses for the land and water. For this study, the state (Utah) was divided into six regions which are essentially homogeneous as to production costs; these regions were evaluated in terms of water resources, crop marketing procedures and production costs for the major irrigated crops. More than 750,000 irrigated acres were used for crop production in 1970 and 1971. Sources for irrigation water include diverted stream and other surface water used for flooding the fields and pumped groundwater; sprinkler systems, dirt ditches, and flood irrigation are popular delivery techniques. Several irrigation districts in one region have constructed holding dams to store spring runoff water to extend the supply over the entire growing season. Costs were computed using a synthetic budgeting method and in such a manner as to be comparable with similar costs in other states. (Jahns-Arizona)
W76-09063

COMPARATIVE EVALUATION OF YEARLY CLIMATIC FACTORS WITH THE FIVE YEARS AVERAGES FOR FUDHALIYA AGRO-METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09066

COMPARATIVE EVALUATION OF CLIMATIC FACTORS AND CONDITIONS AT FUDHALIYA AGRO-METEOROLOGICAL STATION AND BAGHDAD AIRPORT METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09067

EFFECT OF HARDENING ON THE STATE OF WATER IN SEEDLINGS OF WINTER CULTURES, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
For primary bibliographic entry see Field 2I.
W76-09095

EFFECT OF AIR HUMIDITY ON STOMATAL AND MESOPHYLL CONDUCTIVITY OF BEAN LEAVES AT TWO SOIL MOISTURE LEVELS, (IN RUSSIAN)
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
For primary bibliographic entry see Field 2I.
W76-09097

WATER CONSERVATION AND IRRIGATED AGRICULTURE,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
W. E. Schmisseur.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p 73-80. 4 fig, 7 ref.

Descriptors: *Water conservation, *Agriculture, *Irrigation efficiency, Adoption of practices, Pricing, Pacific Coast region, Oregon.

The irrigation district's policies and farm practices to conserve water use are defined to include increasing water delivery to crops from existing supplies by reducing water transportation losses; maintain the level of water delivery to crop site but increase utilization efficiency; reduce the variability of crop yield associated with a given water supply by diminishing climatic effects and disease control; and reduce the year-to-year variability of the district's water supplies. The determinant for water conservation at the farm level involves economic issues in resource allocation. The policies, practices, and factors affecting water conservation and its effects on the irrigation district and its farmer clientele are district water pricing, water supply and/or supply restrictions. While a variable water charge is designed to ration water, in practice, such pricing policies are mostly ineffective because the unit price of water is set too low. An effective water pricing policy can promote water conservation at the farm level by inducing substitute technology. Exogenous impacts on water conservation at the farm level are more water efficient crop varieties, improved irrigation methods, economic conditions, public and political pressures, and labor price. Effective approaches to efficient water use in agriculture are water pricing or rationing because they can effect change at a more controlled rate. (See also W76-09230) (Auen-Wisconsin)
W76-09236

WATER AND FOOD PRODUCTION DEMANDS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 6D.
W76-09237

WIND EROSION: THE PROTECTIVE ROLE OF SIMULATED STANDING STUBBLE,
Agricultural Research Service, Manhattan, Kans. North Central Region.
For primary bibliographic entry see Field 4D.
W76-09247

EROSION FOR CORN TILLAGE SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
J. C. Siemens, and W. R. Oschwald.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 69-72, January-February 1976. 3 fig, 6 tab, 14 ref.

Descriptors: *Erosion control, *Cultivation, *Farm management, Crops, Corn(Field), Rainfall, Simulated rainfall, Sediments, Nutrients, Runoff, Soil erosion, Soil conservation, Agricultural runoff, Agricultural engineering, Agriculture.

The erosion control effectiveness of six tillage-planting systems after planting in corn residue was measured. The tillage systems utilized different types and amounts of tillage in order to produce soil surfaces that varied in residue quantity and soil looseness in the tilled layer. A rainfall simulator for application of simulated rain to plots was described. Conservation tillage systems following corn such as chop-plant, disk-chisel, coulter-chisel, and chisel can significantly reduce soil loss from that of fall plow. After planting, these tillage systems have a greater impact on soil loss than on surface runoff. The loss of N and P in surface runoff may not differ significantly between tillage treatments, given the fertilizer application practices followed by most Corn Belt crop producers. Conservation tillage systems can, however, significantly influence the loss of total N and P as a result of the influence on sediment removal. Total N and P loss may have little short-term influence, but accumulated losses over time will eventually influence the need for N and P fertilizers. (Sims-ISWS)
W76-09248

SURFACE RESIDUE, WATER APPLICATION, AND SOIL TEXTURE EFFECTS ON WATER ACCUMULATION,
Agricultural Research Service, Bushland, Tex.; and Southwestern Great Plains Research Center, Bushland, Tex.
For primary bibliographic entry see Field 2G.
W76-09258

THE AVAILABILITY OF GROUND WATER FOR IRRIGATION IN THE RICE LAKE-EAU CLAIRE AREA, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 4B.
W76-09348

PUMPS.
For primary bibliographic entry see Field 8C.
W76-09351

IS YOUR PUMP A CANDIDATE FOR INEFFICIENCY.,
J. Schleicher.
Irrigation Age, Vol. 10, No. 8, p 12-14, May-June, 1976.

Descriptors: *Farm equipment, *Irrigation engineering, *Pumps, Performance, Water costs, Pump testing, Distribution systems, Sprinkler irrigation, Irrigation efficiency, Water wells, Water quality, Iron bacteria.
Identifiers: Sand pumping wells, Belt-driven pumps.

Rising energy costs have resulted in irrigators paying closer attention to the operating efficiencies of their pumping systems. This means that irrigators will probably be willing to invest more capital initially to purchase more efficient pumping systems, that in the long run will save them money by reducing their power bills. A new pump system should obtain 65% wire to water efficiency from an electric powered system. If a natural gas powered pump is used, 15% overall plant efficiency would be acceptable. The average lifetime of a pump is 20 to 25 years. If the pump is worked hard its life can be reduced. An expert should be called periodically to test the system's efficiency. If the efficiency is at 35 to 40% then the pump should be reconditioned or replaced. It is very important to match the pump to the irrigation system. Declining water tables will not only reduce pump system efficiency but may also result in damage to a pump if surging or cavitation occurs. Sand pumping and poor water quality can result in damage and more frequent maintenance of the pump. (Gass-NWWA)
W76-09352

AGRONOMIC AND CATTLE STUDIES WITH MUNICIPAL LIQUID DIGESTED SLUDGE,
Agricultural Research Center, Jay, Fla.
For primary bibliographic entry see Field 5E.
W76-09367

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

IMPLICATIONS OF ZONING AS AN URBAN WATER MANAGEMENT MEASURE,
Georgia Univ., Athens. Dept. of Real Estate.
For primary bibliographic entry see Field 6F.
W76-08755

STRUCTURAL PERFORMANCE OF BURIED PLASTIC DRAIN TUBING,
Utah State Univ. Logan. Engineering Experiment Station.
For primary bibliographic entry see Field 8G.
W76-08771

TROUT POPULATION RESPONSES TO STREAMFLOW FLUCTUATION AND HABITAT MANAGEMENT IN BIG ROCHE-A-CRI CREEK, WISCONSIN,
R. J. White.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2469-2477, 1975 8 fig., 6 ref.

Descriptors: *Brook trout, Sport fish, Stream fisheries, *Rainbow trout, *Brown trout, Channels, *Natural flow, Streams, Runoff, *Natural streams, *Banks, *Shoreline cover, Streamflow, Wisconsin, Low flow, Water level fluctuations.
Identifiers: *Big Roche-a-cri Creek(Wisc), Overhead cover, Hiding cover, Size classes, Stream banks.

In a field study of Big Roche-a-cri Creek, a trout stream in Wisconsin, it was determined that in a given stream reach (1) the more water, the more trout, (2) year-to-year change in stream flow regime may often govern trout abundance, (3) narrowing the stream and providing overhead hiding cover can help to ameliorate unfavorable effects of a low flow, (4) greatest benefits of such management accrue to the larger size classes of trout. (Katz)
W76-08789

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME I, INDIAN BEND WASH REPORT.
Army Engineer District, Los Angeles, Calif.
Prepared for Maricopa County, Arizona, June 1964. 21 p, 1 fig, 19 plates, 1 tab, 3 append, 18 ref.

Descriptors: Floods, *Sheet flows, *Floodways, *Flood plains, Flood flow, *Flood forecasting, *Flood frequency, Channels, Flash flood, Storms, Historic floods, Flood data, Peak discharge, Non-structural alternatives, Control structures, Channel improvement, Flood protection, *Arizona.
Identifiers: *Maricopa County(AZ), Indian Bend Wash(AZ), Paradise Valley(AZ), Standard Project Flood, 100-year flood, 25-year flood.

The portion of Indian Bend Wash (a tributary of the Salt River) covered in this report extends 8.5 miles from Indian Bend Road northwesterly to Greenway Road, that portion of the drainage area upstream from the Arizona Canal which can divert flood flows of up to 2,000 cubic feet per second in a westerly direction, has a drainage area of 152 square miles. The flood plain is up to 4,000 feet wide and is subject to overland or sheet flows. Growth from Phoenix, Paradise Valley, and Scottsdale is prompting more residential development and some light industrial development. Future development plans include building an express highway paralleling Indian Bend Wash for the full length of the study reach. The natural floodway is shallow, not well defined, and unimproved except for a levee from Mahon Road to Indian Bend Road. Nine floods have occurred since 1921 resulting from general winter and summer storms and thunderstorms. Flood area maps delineate flood limits for Standard Project Flood, 100-year flood, and 25-year flood. The 100-year flood will have a peak discharge of 40,000 cubic feet per second at the gage .5 mile upstream from the Arizona Canal. The SPF will have a peak discharge of 72,000 cfs and average velocities of 5 ft/sec. Guidelines for reducing future flood damage include flood control works, flood plain management, and floodway zoning. A channel improvement project is under consideration. (See also W76-08807, W76-08808 and W76-08809) (Henley - North Carolina)
W76-08806

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME II, CAVE CREEK REPORT,
Army Engineer District, Los Angeles, Calif.
Prepared for Maricopa County, November 1964. 24 p. 2 fig, 15 plates, 10 ref, 3 append.

Descriptors: *Floodways, *Flood plains, Floods, Flood flow, *Flood forecasting, *Flood profiles, *Non-structural alternatives, Channels, Historic floods, Flood frequency, Storms, Reservoirs, Control structures, Flood plain zoning, *Arizona.
Identifiers: Maricopa County(AZ), Cave Creek(AZ), Rowler Wash(AZ), Mexican Wash(AZ), Carefree(AZ), Phoenix(AZ), Salt River(AZ), Standard Project Flood, 100-year flood, 50-year flood, 25-year flood.

The study area extends upstream along Cave Creek (a tributary of Salt River) for 9.5 miles to Rowler Wash, then upstream along Rowler Wash and its tributary, Mexican Wash for 3.25 miles, draining 138 square miles in northeast Maricopa County. Flood plain width ranges from 1,800 feet in the lower reach to 350 feet near the confluence of Cave Creek and Rowler Wash. Though the area is presently undeveloped, residential development pressures are increasing in the wide flood plain. Floods result from general prolonged winter and summer storms and thunderstorms. Along Rowler Wash near the town of Cave Creek, overflows have caused damage. Based on data from similar areas a Standard Project Flood would have an estimated peak discharge of 62,000 cubic feet per second at Cave Creek Reservoir. This exceeds the highest flood peak discharge on record in 1954 at Whitlow Ranch damsite (in the similar drainage area of Queen Creek) by 2,000 cfs. The 100-year flood would discharge 37,000 cfs, the 50-year flood 28,000 cfs, and the 25-year flood 20,000 cfs. Floodway encroachment limits for development and flood profiles are given. The area has no flood plain zoning. (See also W76-08806) (Henley - North Carolina)
W76-08807

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME IV, WICKENBURG REPORT.
Army Engineer District, Los Angeles, Calif.
Prepared for Maricopa County, Arizona, December 1965. 44 p, 12 fig, 20 plates, 13 ref, 3 append.

Descriptors: *Flood plains, Floods, Flood flow, *Flood profiles, *Floodways, *Arizona, Channels, Historic floods, Flood forecasting, Flood data, Flood frequency, Non-structural alternatives, Control structures, Storms, Erosion.
Identifiers: *Maricopa County(AZ), Wickenburg(AZ), Powder House Wash(AZ), Sols Wash(AZ), Sunset Wash(AZ), Casandro Wash(AZ), Flying E Wash(AZ), Hassayampa River(AZ), Standard Project Flood, 100-year flood, Floodway encroachment lines.

Powder House, Sunset, Casandro, Flying 'E', and Sols Wash, tributaries of the Hassayampa River, drain 160.3 square miles in northeast Maricopa County. Although stream flows occur only during storms, the stream channels of these washes are poorly defined and accommodate only minor flows. Floods result from general prolonged winter storms in December through March, and summer storms and thunderstorms in July through September. Seven floods have caused damage since 1944. Wickenburg (1960 population 2,500) is a rapidly growing resort center. Extensive residential development and accompanying commercial development are encroaching on the flood plains of Sunset, Sols, Casandro and Powder House Washes. Property owners have built parallel levees in Sunset and Powder House Washes which act as floodways. However, these are inadequate and floodwaters overflow onto adjacent lands. The maximum flood flow of these five washes occurs in Sols Wash where a 100-year

flood will have a peak discharge of 24,000 cubic feet per second and a Standard Project Flood will have a peak discharge of 45,000 cfs. The SPF would probably result from severe thunderstorms, with a duration of several hours, and would peak soon after the beginning of rainfall. This study delineates: (1) the overflow area of the SPF as the upper limits of flood plains; (2) the areas inundated by the 100-year flood; and (3) floodway encroachment limits for development. Guidelines for reducing flood damage include flood control works, flood plain regulations, subdivision regulations, and zoning. (See also W76-08806) (Henley-North Carolina)
W76-08808

FLOOD PLAIN INFORMATION: MARICOPA COUNTY ARIZONA, VOLUME V, NEW RIVER REPORT.
Army Engineer District, Los Angeles, Calif.
Prepared for Maricopa County, April 1967. 33 p, 9 fig, 18 plates.

Descriptors: Floods, *Flood forecasting, *Flood plains, *Flood stages, *Flood damage, Flood flow, *Non-structural alternatives, *Flood frequency, Floodways, Storms, Historic floods, Peak discharge, Frail lands, Rivers, Channels, Levee, Arizona.
Identifiers: *Maricopa County(AZ), Peoria(AZ), New River(AZ), 100--year flood, 50-year flood, Phoenix (AZ), Aqua Fria River(AZ), Skunk Creek(AZ), Standard Project Flood.

The 27 mile reach of New River, a tributary of Agua Fria River, in this report is the flood plain extending upstream from Greenway Road (near the confluence with Skunk Creek) to the narrows about 5 miles upstream from Black Canyon Highway Bridge near the town the town of New Hope. The width of the flood plain varies from 2,000 to 6,000 feet, with most of the natural channel being shallow and not well defined. Development in the flood plain is almost exclusively agricultural but present rates of population growth in the Peoria area will bring residential development pressure to the flood plain in the near future. Three types of storms occur in the New River basin. General winter storms usually in December through March last for several days with widespread rainfall. General summer storms in June through September bring heavy precipitation for 24 hours over large areas followed by light showers for as long as 3 days. Local thunderstorms cause heavy rains for short periods in small areas. Since 1921, floods have occurred on this reach of New River ten times with some damage to agricultural areas. The worst flood occurred in August, 1943 with peak discharge reaching 38,000 cubic feet per second at the highway bridge at Peoria. A Standard Project flood would have an estimated peak discharge of 55,000 cfs at Greenway Road. Maricopa County has proposed flood plain zoning ordinances but these have not yet been adopted. Some levees have been constructed by private interests. The lower levels of the reach are most susceptible to flooding because of inadequate channel capacities. (See also W76-08806) (Henley - North Carolina)
W76-08809

FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for San Joaquin County, January 1974. 56 p, 23 fig, 37 plates, 10 tab.

Descriptors: Floods, Flooding, *Streamflow forecasting, *Flood profiles, *Peak discharge, *Flood peak, *Flood plains, Dams, Regional flood, Cloudbursts, Historic floods, Flood data, Flood frequency, Flow duration, Flood damage, Erosion, Deposition(Sediments), Obstructions to flow, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Levee, Diversion structures, Channel improvement, *California.
Identifiers: *Stockton(CA), Bear Creek(CA), Calaveras River(CA), Mosher Creek(CA), Stockton Diverting Canal(CA), San Joaquin River(CA), Paddy Creek(CA), Hogan Dam(CA), New Hogan Dam(CA), Mormon Slough(CA).

Properties in this study area are 93% agricultural, 3% residential, .5 to 1% commercial and 4% vehicle rights-of-way. Uses besides agriculture are increasingly slowly. Both principal streams, the Calaveras River with a drainage of 597 square miles, and Bear Creek with a drainage of 28 sq mi, are tributary to the San Joaquin River. Floods occur November to April resulting in high peak flows of moderate duration. Ninteen floods have been recorded by streamflow gages from 1907 to 1973. A flood in 1955 caused damages of $700,000 and had a peak flow of 14,200 cubic ft/sec and a 1958 flood caused losses totalling $1,400,000 with a peak discharge of 12,100 cfs. Hogan Dam (1936) and New Hogan Dam (1964) have lessened the impact of floods. In an Intermediate Regional Flood peak flows ranging up to 13,600 cfs and water velocities of up to 9 ft/sec are predicted. The height of rise would be up to 2.4 feet in 3 to 10 hours, depending on the creek. Time above flood stage would be from 18 to 26 hours. A Standard Project Flood would have a peak discharge of 22,700 cfs. The height of rise ranges up to 5.25 feet in 3 to 20 hours depending on the stream. Floodstage would last from 9 to 46 hours. Many bridges and culverts would be obstructive to flood flow in either major flood. Flood control improvements include levees, channel improvement and a diversion facility which provide 50-60 year flood protection to the City of Stockton. San Joaquin County does not have a full zoning ordinance, though riparian areas are zoned for agricultural uses and structures are required to be set back from levees. The County is elegible for flood insurance. (Smith-North Carolina)
W76-08810

SPECIAL FLOOD HAZARD INFORMATION: MILL CREEK-GEKELER SLOUGH, LA GRANDE, OREGON.
Army Engineer District, Walla Walla, Wash.
Prepared for City of La Grande, Oregon, June, 1973. 8 p, 2 fig, 2 plates.

Descriptors: *Flood plains, *Flood damage, *Planning, *Obstruction to flow, *Floods, Land use, Flood data, Drainage area, Drainage patterns, Alluvial fans, *Oregon, Erosion.
Identifiers: Mill Creek(Oregon), Gekeler Slough(Oregon), Deal Creek(Oregon), *La Grande(Oregon), Taylor Creek(Oregon), Flood plain management, Flood hazard, Intermediate Regional Flood, Standard Project Flood, Sidehill runoff.

Stream and sidehill runoff flood hazards on Mill Creek and Gakeler Slough within the city of La Grande, Oregon, are outlined. Residential properties along these streams have been moderately damaged by past floods. The flood plain west of 10th Street contains the Mill Creek alluvial outwash fan with no well-defined drainage pattern. The area east of 10th Street is not an alluvial fan but also has a poorly defined drainage pattern, consisting of Taylor Creek, Deal Creek, and city area drainage. Deal Creek drainage has been altered by channelization, buried pipes, houses, streets, and the railroad so that its drainage pattern is unclear. Floods from the drainage areas should have short durations of less than 2 days, and should peak in less than a day. High velocity flow could occur any place within the indicated flood plain and could be highly erosive. The steep slopes of Mill Creek in the canyon areas (up to 825 feet per mile) can contribute material ranging from small gravels to large cobbles that effectively plug the stream channel, culverts, and buried conduit. The only known flood in this area occurred in January, 1965. The Intermediate Regional Flood peak discharge of the western and eastern parts are 790 cfs and 1400 cfs respectively. The Standard Project Flood peak discharge is 2100 cfs for the western area and 300 for the eastern area. (Diefendorf-North Carolina)
W76-08811

FLOOD PLAIN INFORMATION: RUSH CREEK-PETALUMA RIVER TO U. S. HIGHWAY 101, MARIN COUNTY, CALIFORNIA.
Jordon/Mathis and Associates, San Francisco, Calif.; and Army Engineer District, San Francisco, Calif.
Prepared for Marin County Flood Control and Water Conservation District, June 1975. 19 p, 10 fig, 10 plates, 1 tab.

Descriptors: *Floods, *Flooding, *Flood profiles, *Flood plains, *California, Overland flow, Overflow, Regional flood, Streamflow forecasting, Winds, Tides, Flood frequency, Peak discharge, Flood plain zoning, Levee.
Identifiers: Rush Creek(CA), Petaluma(CA), Novato(CA), Basalt Creek(CA), Intermediate Regional Flood, Five hundred Year Flood, San Pablo Bay(CA), Petaluma River(CA), Black John Slough(CA).

Development is concentrated mostly in the Upper Rush Creek Basin along Highway 101 and in the City of Novato with 60-70% of the area tributary to Rush Creek consisting of sparsely populated rolling hills covered with brush and trees. Ten to 12 percent of the drainage area is a flood plain and becomes a retention zone during heavy storms. A levee along Basalt Creek, extending to Black John Slough, was built to stop retained water from flowing back into protected areas. Tides in San Pablo Bay are transmitted to the Petaluma River and have an impact on flow characteristics of Black John Slough. Flood season is December to March, though there are floods in November. No streamgage data exists but important floods occurred in 1955, 1956, 1958, 1959 and 1973. High winds, high tides and failing levees have added to the impact of some floods. In an Intermediate Regional Flood peak discharges of 770 cubic feet per second and water velocities of 6 ft/sec are expected. In the case of a 500 year flood a peak discharge of 900 cfs is predicted with slightly higher water velocities. Damage to houses and public facilities could be severe in some areas. Some sections are also subject to flooding from direct rainfall though they would not be flooded by stream water. Hydraulic studies were based on the assumption that all culverts, gates and other conveyance structures were working well, but there is little evidence that this is true all of the time because of silting and mechanical problems. The Corps of Engineers has constructed no flood control structures in the Rush Creek Drainage Basin. Marin County does have Flood Plain Zoning Regulations which establishes Primary and Secondary Floodway Districts. (Smith-North Carolina)
W76-08812

FLOOD PLAIN INFORMATION: KINGS RIVER, SANGER, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for Fresno County, June, 1972. 40 p, 14 fig, 17 plates, 8 tab.

Descriptors: Flood flow, *Historic floods, *Flood plains, *Flood profiles, Reservoirs, Flood forecasting, *Flood frequency, *Floodways, Streamflow forecasting, Storms, Flood data, Peak discharge, Flow duration, Erosion, Deposition, Levee, Reservoir, Channel improvement, Snowmelt, *California.
Identifiers: Sanger(Calif), Fresno County(Calif), *Kings River(Calif), *Mill Creek(Calif), Piedra(Calif), Pine Flat Lake(Calif), Hughes Creek(Calif), Standard Project Flood, Intermediate Regional Flood.

Flood hazards along the Kings River from Pine Flat Lake downstream to the vicinity of Sanger, California (3 miles) and along the lower 4 miles of

Mill Creek, a tributary stream entering the Kings River about 2 miles downstream from Pine Flat Lake, are discussed. Prolonged heavy rainfall between November and April creates high peak flows of moderate duration. More severe flooding occurs when ground is frozen and infiltration is minimal, during saturated ground conditions or with the addition of snow melt in late spring and early summer. Pine Flat Lake Project, completed in 1954 by the Corps of Engineers, has prevented damage in the area estimated at $88,330,000. Since its completion, there have been two floods resulting from rainfall and two snowmelt floods. The worst occurred in January, 1969, with peak discharge on Kings River at the gage at Piedra, reaching 16,000 cubic feet per second. Damage to orchards, vineyards, farmlands, and residences around Centerville was estimated at $700,000. Under existing conditions flooding may result from uncontrolled flows of Mill and Hughes Creeks and from large controlled outflows from Pine Flat Lake during major snowmelt floods. An Intermediate Regional Flood would have a peak discharge of 21,000 cfs at Piedra Road Bridge, channel velocities of 4-7 ft/sec and overbank flows of 1-4 ft/sec. A Special Project Flood would have a peak discharge of 26,000 cfs at the same location. Four bridges, vegetation, and boxes and crates stored in the flood plain can be expected to obstruct flood flows. (Henley-North Carolina)
W76-08813

FLOOD PLAIN INFORMATION: DRY CREEK AND TRIBUTARIES, ROSEVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for the City of Roseville, May, 1973. 40 p, 21 fig, 19 plates, 8 tab.

Descriptors: Floods, Flood flow, *Flood forecasting, *Flood profiles, *Flood stage, *Erosion, *Flood plains, Flooding, Storms, Historic floods, Flood data, Flood frequency, Flood peak, Bank erosion, Flood plain zoning, Warning systems, Channel improvement, *California.
Identifiers: *Roseville(Calif), Placer County(Calif), Dry Creek(Calif), Standard Project Flood, Intermediate Regional Flood, Antelope Creek(Calif), Cirby Creek(Calif), Linda Creek(Calif).

Lands in the study area along Dry, Antelope, Cirby, North Cirby, and Linda Creeks (drainage area equal 80 sq mi) are urbanized to various degrees ranging from scattered residential development to well established business districts. Vegetation, 12 bridges, 8 culverts, and 3 foot bridges could be expected to obstruct flood flows. Floods occur as the result of prolonged heavy rainfall between October and May. Total runoff volume is large with duration above flood stage on Dry Creek lasting as much as 12 hours during an Intermediate Regional Flood (IRF). Roseville has recently improved Dry Creek channel and has put in effect an Interim Flood Plain Zoning Ordinance. Sixteen floods have occurred in the last 40 years, the worst in October, 1962. Peak discharge reached 4,400 cubic feet per second on Dry Creek with considerable bank erosion, damage to water lines and residences. An IRF can be expected to have a peak discharge of 9,200 cfs with channel velocities of 5-7 ft/sec and overbank velocities of 1-3 ft/sec. A Standard Project Flood would have a peak discharge of 15,400 cfs, with slightly higher velocities than an IRF. Both floods would inundate agricultural lands, residential areas, parks, streets, commercial developments and public utilities. (Henley-North Carolina)
W76-08814

FLOOD PLAIN INFORMATION: GUADALUPE RIVER, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Santa Clara County Flood Control and Water District, January, 1972. 22 p, 3 fig, 18 plates, 6 tab.

Descriptors: Floods, Flooding, *Flood forecasting, *Flood profiles, *Floodways, *Flood plains, *Subsidence, Overflow, Flood flow, Streamflow forecasting, Maximum probable flood, Historic floods, Peak discharge, Flood peak, Flood damage, Obstruction to flow, Control structures, Levee, Reservoirs, Water storage, Percolation, *California.
Identifiers: *Guadalupe River(Calif), Calero Reservoir(Calif), San Jose(Calif), Almaden Reservoir(Calif), Alviso(Calif), Guadalupe Reservoir(Calif), Intermediate Regional Flood, Standard Project Flood, San Francisco Bay(Calif), Percolation basins.

Since World War II Santa Clara County has grown very rapidly and much former agricultural land has been taken over by residential and light industrial developments. Growth in this area, which includes cities of San Jose, Sunnyvale, Alviso, and part of the City of Santa Clara, is likely to continue at a rapid rate. The river system of which the Guadalupe is a part drains about 160 square miles. Calero, Almaden and Guadalupe contribute to the regulation of peak flows with 27,000 acre-feet additional storage provided on Los Gatos Creek. Main flood season extends from October through April when flooding may be caused by intense rainstorms over or adjacent to the Guadalupe Basin. Streamflow data has been available from gaging stations since 1930. The largest flood occurred in 1958 when the stream gage height of 16.55 ft, and a peak discharge of 9,150 cfs were recorded. Damages totaling $1,348,000 were reported. In the event of an Intermediate Regional Flood (IRF) it is anticipated that a peak discharge of 17,000 cfs may be reached with water velocities from about one ft/sec near to San Francisco Bay to about 12 ft/sec in the upper reaches. A Standard Project Flood (SPF) could produce a peak discharge of 34,000 cfs. Most of the 42 bridges and culverts are obstructive to the IRF and even more obstructive to the SPF. In some areas land subsidence has been as much as 14 ft, averaging 8 or 9 ft over the area subject to flooding, which has greatly increased flood hazards. Levees constructed and maintained by local interests on the Guadalupe and its tributaries provide some flood protection, as do the reservoirs and percolation basins within the system. (Smith-North Carolina)
W76-08815

FLOOD PLAIN INFORMATION: UMATILLA RIVER TRIBUTARIES, MCKAY, TUTUILLA AND WILDHORSE CREEKS, PENDLETON, OREGON AND VICINITY.
Army Engineer District, Walla Walla, Wash.
Prepared for Umatilla County, Oregon, March 1971. 43 p, 13 fig, 22 plates, 4 tab.

Descriptors: Floods, Flooding, *Flood profiles, *Historic floods, *Flood stages, Flow duration, *Flood frequency, *Runoff, Flow characteristics, Flood plains, Channels, Snowmelt, Non-structural alternatives, Levee, Reservoirs, *Oregon.
Identifiers: McKay Creek(OR), Tutuilla Creek(OR), Wildhorse Creek(OR), Umatilla River(OR), *Pendleton(OR), McKay Dam and Reservoir, Intermediate Regional Flood, Standard Project Flood.

The McKay, Tutuilla and Wildhorse Creeks are tributaries of the Umatilla River all of which originate in the Blue Mountains. The drainage areas for each is: McKay Creek, 190 sq mi; Tutuilla Creek, 59 sq mi; Wildhorse Creek, 205 sq mi. Development of McKay Creek's flood plain includes residential, commercial and agricultural areas as well as roads. For Tutuilla and Wildhorse Creeks, development of flood plains consists of limited residential and agricultural development. Obstructions to flows include vegetation, bridges, buildings close to the channel, and poor channel alignment. Flood damage prevention measures vary widely among the three creeks. McKay Dam and Reservoir, built in 1926, gives adequate protection from peak flows. Prevention measures on Tutuilla Creek are limited to widening the channel, increasing the capacity of the stream. Snowmelt due to the rapid warming caused by chinooks, and rainfall running off frozen ground are the principle causes of flooding. The Intermediate Regional Flood and the Standard Project Flood for each creek is: McKay Creek, 4,000 and 15,300 cubic feet per second; Tutuilla Creek, 3,400 and 6,700 cfs; Wildhorse Creek, 9,600 and 16,000 cfs. For an IRF channel and overbank velocities are 10 and 3, 13 and 4, 16 and 5 ft/sec for McKay, Tutuilla and Wildhorse Creeks respectively; and for an SPF, 14 and 5, 16 and 6, 17 and 5 ft/sec respectively for these same streams. (Gentry-North Carolina)
W76-08816

FLOOD PLAIN INFORMATION: COW CREEK, PALO CEDRO, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for Shasta County, June 1971. 36 p, 17 fig, 16 plates, 6 tab.

Descriptors: Floods, Flood flow, *Streamflow forecasting, *Flood profiles, *Flood data, *Flow duration, *Flood plains, Storms, Historic floods, Flood frequency, Flood stages, Flow characteristics, Flood damage, Bank erosion, Warning systems, Dams, Snowmelt, Obstructions to flow, *California.
Identifiers: Shasta County(CA), Cow Creek(CA), *Palo Cedro(CA), Millville(CA), Bella Vista(CA), Little Cow Creek(CA), Dry Creek(CA), Oak Run Creek(CA), Standard Project Flood, Intermediate Regional Flood.

The portion of Cow Creek and its tributaries, Dry Creek, Oak Run Creek and Little Cow Creek, covered in this report have a total drainage area of 428 square miles. The watershed is located in the northern end of Sacramento Valley in Shasta County, CA. Development in the flood plain is limited to mostly agricultural uses, but there is some residential and commercial development which is susceptible to flooding. Vegetation and 6 bridges obstruct large flood flows. The flood season is from November to May when rains are heaviest and most prolonged. Flooding is most severe when the ground is saturated or frozen or when snowmelt occurs. Eight floods have occurred since 1937, but information on them is sparce. Streamgage data indicates that the largest flood occurred in 1951 when a peak discharge of 42,500 cubic feet per second was recorded on Cow Creek. Floods in the past have washed out bridges, powerhouses and buildings in Shasta County, and with some loss of life. An Intermediate Regional Flood would have a peak discharge of 63,000 cfs on Cow Creek, along with water velocities of 11-15 ft/sec in the channel and 2-5 ft/sec in overbank areas. This flood would rise to peak in 8 hours and last 16 hours above critical stage. A Standard Project Flood would have a peak discharge of 93,000 cfs and water velocities slightly higher than the IRF. The floodwould rise to peak in 17 hours and last 28 hours. One dam in the area reduces flood peaks. A flood warning system exists in the area. (Henley - North Carolina)
W76-08817

FLOOD PLAIN INFORMATION: DARDENNE AND BELLEAU CREEKS, ST. CHARLES COUNTY, MISSOURI.
Army Engineer District, St. Louis, Mo.
Prepared for the County of St. Charles, April 1972. 22 p, 10 fig, 15 plates, 4 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, *Missouri, Flooding, Flood flow, Streamflow forecasting, Flood forecasting, Peak discharge, Flood peak, Flow duration, Flow characteristics, Levee, Channel improvement.
Identifiers: *Dardenne Creek(MO), *Belleau Creek(MO), St. Charles County(MO), St Peters(MO), Standard Project Flood, Intermediate Regional Flood.

In the floodplains of both the streams of this study area are many residential and commercial structures, particularly in the village of St. Peters(MO) which is situated just outside of the Mississippi River flood plain. Belleau Creek, which drains 10.5 square miles, is a tributary of Dardenne Creek which has a drainage area of 102 sq mi and flows into the Mississippi River. Floods can occur at any time of the year and can rise very quickly after intense rainfall that accompanies severe storm fronts. No stream gage records exist for this area. Accounts of past floods have been taken from newspapers. Damaging floods have occurred as far back as 1882, the most recent in 1970. Large sections have been flooded in past events and damage has been compounded sometimes by the breaching of levees. In an Intermediate Regional Flood (IRF) peak discharges of 4500 cfs and 22,000 cfs are expected on Belleau and Dardenne Creeks, respectively, along with water velocities in the main channel from 1 to 7 ft/sec and 1 to 3 ft/sec in overbank areas. On Belleau Creek the IRF would rise to peak in 3 hours and last 12 hours above critical stage and on Dardenne Creek would rise to peak in 9 hours and last 25 hours. A Standard Project Flood would have peak discharges of 7600 and 41,700 cfs on Belleau and Dardenne Creeks, respectively. Water velocities would be slightly higher than during the IRF. The flood would reach peak in 7 to 13 hours on Belleau and Dardenne Creeks, respectively, and would last 19 hours and 37 hours on the two creeks. Most of the 21 bridges and culverts in the area are obstructive to flow in large floods. The only flood protection efforts have been levees and channel improvements. (Smith-North Carolina)
W76-08818

FLOOD PLAIN INFORMATION: ST. CHARLES COUNTY, MISSOURI, PART 2, PERUQUE CREEK.
Russell and Axon, St. Louis, Mo.; and Army Engineer District, St. Louis, Mo.
Prepared for the County of St. Charles, Missouri, July 1973. 27 p, 10 fig, 16 plates, 4 tab.

Descriptors: *Floods, *Flood forecasting, *Flood profiles, *Flood plains, *Missouri, Flooding, Regional flood, Streamflow forecasting, Historic floods, Peak discharge, Flood peak, Flow duration, Obstructions to flow, Levee, Lakes.
Identifiers: St. Charles County(MO), *Peruque Creek(MO), Lake St. Louis(MO), Standard Project Flood, Intermediate Regional Flood.

St. Charles County is rapidly urbanizing, having increased its population 75%, from 53,000 to 93,000 during the 1960's, and lost 55,000 acres of farmland and 6492 acres of cropland to urban needs. There are only a few farm buildings, and roads in the floodplain, but future large floods might cause severe damages if construction is permitted in the flood prone areas. Peruque Creek, a tributary of the Mississippi River, drains 72 square miles above the Mississippi flood plain. Flooding along this creek is not seasonal, and can occur at any time of the year. There are no stream gages in this area, but local residents believe that a 1946 flood was the largest in recent years. Newspaper accounts indicate that past floods have caused little damage though some structures and highways have been inundated. In an Intermediate Regional Flood (IRF) a peak discharge of 24,400 cfs is expected along with water velocities from 3 to 11 feet per second in the channel and 1 to 3 ft/sec in overbank areas is expected. This flood would rise to peak in 5 hours and remain above floodstage 18 hours. Thirteen of 20 bridges in the study area would be obstructive to flow. In a Standard Project Flood a peak discharge of 46,300 cfs is predicted and water velocities slightly higher than the IRF. The flood will reach peak in 29 hours and last 43 hours. All but two bridges would be obstructive to flood flow. Little in the way of flood protection has been undertaken to date. Lake St. Louis, near the center of this area, cannot be considered to possess flood storage capacity due to spillway design. A proposed Lake Wentzville is being considered for flood control. (Smith - North Carolina)
W76-08819

FLOOD PLAIN INFORMATION: MIDDLE RIVER ROUGE, NORTHVILLE, MICHIGAN.
United States Lake Survey, Detroit, Mich.
44 p, 12 fig, 8 plates, 13 tab. Prepared for Water Resources Commission, Michigan Department of Natural Resources and Southeast Michigan Council of Governments and the City of Northville, 1971.

Descriptors: Floods, Flooding, *Flood forecasting, *Flood profiles, Flow duration, *Flood plains, *Land use, *Michigan, Flooding, Regional flood, Streamflow forecasting, Maximum probable flood, Historic floods, Flood data, Peak discharge, Erosion, Rivers, Non-structural alternatives, Planning, Dams.
Identifiers: *Middle River Rouge(MI), Northville(MI), Phoenix Lake Dam(MI), Standard Project Flood, Intermediate Regional Flood.

Within the study reaches, portions of industrial, recreational and other open space, and residential development have experienced past flooding. Many structures are only slightly above stages expected in an Intermediate Regional Flood (IRF). The Middle Rouge has a drainage of 110 square miles of predominantly flat land, 56.5 sq mi of which is above the downstream study limit and includes the town of Northville and a portion of Phoenix Lake. In winter and spring floods result from general heavy rains, though floods may also occur during summer from local intense thunderstorms. Stream gages, in place since 1947, indicate a general trend toward larger flows. The largest flood, in 1947, reached disastrous proportions according to accounts. The slightly lower 1968 flood produced a peak discharge of 2440 cubic feet per second. In an IRF it is estimated that a peak discharge of 2350 cfs would occur at the local Phoenix Lake Dam along with water velocities of up to 8 feet per second in the main channel and 1.4 ft/sec in the flood plain. This flood would rise to peak in about 19 hours and last 56 hours above bankfull. During a Standard Project Flood a peak discharge of 5950 cfs is expected and water velocities of 10.9 ft/sec in the channel and 2.15 ft/sec in overbank areas. This flood would reach peak in 21 hours and last 89 hours. During this flood all bridges except 3 would be inundated and cause a heavy loss of head. The Wayne County Road Commission has been acquiring flood plain lands for many years in order to restrict flood plain development and development of open space. (Smith-North Carolina)
W76-08820

FLOOD PLAIN INFORMATION: SAPPA CREEK, OBERLIN, KANSAS.
Army Engineer District, Kansas City, Kans.
Prepared for the City of Oberlin, Kansas, November, 1973. 26 p, 14 fig, 9 plates, 3 tab.

Descriptors: Floods, Flooding, *Flood control, *Flood plains, *Flood damage, *Flood profiles, Flood protection, Levees, *Kansas.
Identifiers: *Sappa Creek(Kansas), Oberlin(Kansas).

Located in Northern Kansas, Sappa Creek has a drainage area of 1063 sq mi and consists of 3 separate streams flowing together near Oberlin. The creek then flows northeasterly to its confluence with the Republican River. A well-defined surface drainage pattern has been created by an old stream meander and sidehill drainage. Study area flood plain width ranges from 1/2 to 1 mile. The channel slopes approximately 6 ft/mi. Most of Oberlin's business district, and a sewage treatment plant which is protected by a levee, lie in the flood plain. A lake built flood control is practically silted in and offers no protection. Stream gaging records show that flood season begins with spring rains and continues through early summer. Flows are characterized by high stages, high velocities and medium length duration. A storm on either of the two main branches of the Creek or over the entire area could cause flooding at Oberlin. Bridges and the city itself present the greatest obstruction to flow with brush and debris obstructing the channel and bridge openings. No planned flood damage prevention program exists. The greatest known flood occurred on July 16, 1944 with a peak discharge of 10,600 cfs. An Intermediate Regional Flood and Standard Project Flood (SPF) woul have discharges of 21,000 cfs and 41,000 cfs respectively. An SPF would peak in about 45 hours, rising at a maximum rate of 1 ft/hr with Sappa Creek out of banks about 6 1/2 days. Under these flood conditions the flood plain area would be inundated, causing widespread damage in Oberlin. (Salzman - North Carolina)
W76-08821

FLOOD PLAIN INFORMATION: ARKANSAS RIVER, DERBY-MULVANE, KANSAS.
Army Engineer District, Tulsa, Oklahoma.
Prepared for the Kansas Water Resources Board, June 1975. 25 p, 6 fig, 9 plates, 4 tab.

Descriptors: Flooding, Flood flows, *Flood profiles, *Historic floods, *Flood stages, *Runoff, *Flood forecasting, Flood data, Flood frequency, Flow duration, Peak discharge, Flood peak, Flow characteristics, Flood plain, Channels, *Kansas.
Identifiers: Mulvane(KS), Derby(KS), *Arkansas River(Kan), Sumner County(KS), Sedgewick County(KS), Intermediate Regional Flood, Standard Project Flood.

The study area is 9.6 miles of the Arkansas River, from about three miles below the city of Mulvane (population 3,185) to the city of Derby (population 7,947). Although the Arkansas River drains 33,700 square miles above the Derby gage, only 3,566 sq mi of contributing drainage area between Derby and Great Bend, Kansas, are effective in producing flood peaks at the upper end of the study limit, 3,638 sq mi at the lower end. The flood plain in the study area is about 3.5 miles wide, and flat. Heavy rainstorms are generally responsible for flood peaks, occurring during the months of April through October. There have been 10 major floods since 1944, the largest of record being that of October 1973 with a peak flow of 45,800 cubic feet per second. Development along the river has been recent, and is predominantly agricultural, with recent residential development including individual homesites, housing developments and mobile home communities. Four bridges and vegetation can obstruct flood flows. The Intermediate Regional Flood and the Standard Project Flood will have peak discharges of 76,000 and 138,000 cfs respectively. Channel and overbank velocities during the IRF will be 3.7 and 1.9 ft/sec respectively, for the SPF 4.5 and 2.5 ft/sec respectively. (Gentry-North Carolina)
W76-08822

THE IN VITRO SENSITIVITY OF SOME SPECIES OF CHLOROPHYCEAE TO A SELECTED RANGE OF HERBICIDES,
Saskatchewan Univ., Regina. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08824

EFFECTS OF INITIAL FLOODING ON FOREST VEGETATION AT TWO OKLAHOMA LAKES,
Oklahoma State Dept. of Agriculture, Oklahoma City.
M. D. Harris.
Journal of Soil and Water Conservation, Vol. 7, No. 7, p. 294-295, 1975. 3 tab.

Descriptors: *Trees, *Flooding, *Reservoirs, Impounded waters, *Oklahoma, Varieties, Hardwood, Submergence, Shrubs, Stress, Vegetation, Recreation, Mortality, Maple trees, Oak trees,

Cottonwoods, Hickory trees, Ash trees, Sycamore trees, Willow trees, Pecans, Birch trees, Lakes.
Identifiers: Reservoir flood pool, Hackberry, Elm, Buttonbush, Mulberry, Baldcypress, Water-tolerant trees, Kingstone Reservoir(Okla), Oologah Reservoir(Okla).

Post-flood surveys were made of hardwood trees in flood pools of Keystone and Oologah impoundments, Oklahoma. Inundation lasted 7-100 days, with the first 10 ft lasting 67-73 days. Flood damage was most severe in the first 10 feet above normal pool level. Above this, mortality of smaller trees and shrubs was greatest though most larger trees survived. Most completely submerged trees were killed. Trees with some crown above water or which were only submerged for a few days showed stress in July--small, malformed, yellowing leaves on main branches only. Increment borings revealed discolored cambium layers and sour smells. About 80% of the trees that showed stress and were less than 10 inches in diameter at breast height and 25 feet tall died. Larger, taller showed no visible stress except for reduced later summer growth rates. Mortality was highest among oak-hickory types and increased as size decreased. Mortality was less with hackberry, pecan, elm, green ash, sycamore, cottonwood, and willows. When properly planted and maintained, green ash, sycamore, cottonwood (cottonless), buttonbush, willow, mulberry (fruitless), silver maple, bald-cypress, and river birch grow rapidly and are soon tall and large enough in diameter to withstand flooding. (Buchanan-Davidson--Wisconsin)
W76-08831

A CRITICAL STUDY OF FLOOD PROTECTION PLANNING IN THE SUSQUEHANNA RIVER BASIN: 1936-1972,
Cornell Univ., Ithaca, N. Y.
For primary bibliographic entry see Field 6F.
W76-08846

USER CHARGES FOR INLAND WATERWAYS: A REVIEW OF ISSUES IN POLICY AND ECONOMIC IMPACT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
L. A. Shabman.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 765, $5.50 in paper copy, $2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 91, May 1976. 106 p, 8 fig, 22 tab. OWRT B-061-VA (1)

Descriptors: *Inland waterways, *Use rates, Water rates, Navigation, Evaluation, *Cost analysis, Cost sharing, Water policy, *Economic impact, Benefits, Taxes.
Identifiers: *User charges.

Numerous studies have discussed the various issues associated with the adoption of user charges for inland waterways. This study is a synthesisof these discussions, and a preliminary analysis, using secondary data sources, of the economic impact of alternative user charge policies. The main conclusions are: (1) the benefits of a free waterway policy are shifted forward to shippers and their customers; (2) a fuel tax would have limited effects on traffic movements while a segment toll would result in closing of some parts of the waterway system. Under the most severe cost conditions, only 3 percent of the total traffic would move from the system.
W76-08847

FIELD EVALUATION OF A PREDICTIVE MODEL FOR THERMAL STRATIFICATION IN LAKES AND RESERVOIRS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-08920

MODELS FOR EVALUATION OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 950, $5.00 in paper copy, $2.25 in microfiche. Publication No. 32, Massachusetts Water Resources Research Center, Amherst, January 1976. 91 p, 8 fig, 18 tab, 60 ref. J. S. Larson, editor. OWRT B-023-MASS(14), 14-31-0001-3596.

Descriptors: *Wetlands, Economics, Wildlife, Aesthetics, Flood control, Evaluation, Northeast U. S., *Model studies, *Massachusetts, Planning, Regulation.
Identifiers: Groundwater models, Economic models.

Four sub-models for relative and economic evaluation of freshwater wetlands are presented within a single, three-phase eliminative model. Wildlife and visual-cultural models are based on physical characteristics. Each characteristic is given values by rank and coefficient. A relative numerical score is calculated for the total wetland characteristics and used to compare it with a broad range of northeastern wetlands. A groundwater model places wetlands in classes of probable groundwater yield based on surficial geologic deposits under the wetland. An economic submodel suggests values for wildlife, visual-cultural aspects, groundwater and flood control. The submodels are presented within the framework of an overall three-phase eliminative model. Phase I identifies wetlands which should be protected at all costs. Phase II applies the wildlife, visual-cultural and groundwater sub-models to those wetlands which do not meet the criteria for outstanding wetlands. Phase III develops the economic values of the wetlands evaluated in Phase II. The models are intended to be used by local, regional and state resource planners and wetland regulation agencies.
W76-08921

METHODS OF ESTIMATING RESIDENTIAL LAND USE FOR WATER RESOURCES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Economics.
For primary bibliographic entry see Field 4C.
W76-08924

WATER CONTROL SOLVES TOUGH SEWER PROBLEM,
For primary bibliographic entry see Field 8B.
W76-08967

URBAN RUNOFF MODELLING,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Div.
J. Marsalek.
Civic, Vol. 27, No. 3, p 32-36. March 1975, 3 fig, 2 tab, 3 ref.

Descriptors: *Model studies, *Computer models, *Runoff, *Urban runoff, Hydraulic models, Storm runoff, Water quality, Urban drainage.
Identifiers: *Hydrocomp model.

Because of new concepts in urban drainage design, such as runoff control at source, detention, retention and storm water quality considerations, new predictive methods are needed for urban runoff. A model is needed which transforms an input rainfall into a runoff hydrograph for a particular urban area. Features of existing models are summarized. Most include the following components: catchment hydrology (precipitation, infiltration, detention, retention, and surface runoff); sewer hydraulics; and water quality aspects. A table shows whether or not 22 existing models take 16 factors in these three areas into account. There is a wide variation among models, from 1 aspect taken into account by the unit hydrograph to 14 or 16 aspects accounted for by the model called Hydrocomp. In comparison to the traditional 'rational' method of predicting runoff, the computer models are far more accurate. Calibration can improve a model for use in a particular area. With such a model an engineer can design a drainage system in an area including various runoff control schemes and estimating resulting pollution in receiving waters. A wide variety of user needs can be satisfied by available models and for many, computer programs are available. It is recommended that municipalities start collection of precipitation runoff data for future design of urban drainage. (Smith-North Carolina)
W76-09033

THE PHRAGMITETEA AND MOLINIETALIA ASSOCIATIONS IN THE THAYA, MARCH AND DANUBE RIVER BASINS OF AUSTRIA, (IN GERMAN),
E. Balatova-Tulacova, and E. Huebl.
Phytocoenologia. 1(3); p 263-305, 1974.

Descriptors: *River basins, Europe, *Meadows, Humidity, Moisture, Soil analysis, Temperature, Precipitation(Atmospheric).
Identifiers: *Austria, Danube River basin, *Molinietalia, *Phragmitetea, Thaya(River Basin).

A phytosociological and ecological description of moist and wet meadows along the rivers Thaya, March and Danube in the northeastern part of Austria is given. Mean annual temperatures in the region range from 9-10C average precipitation from 559-612 mm. Most of the associations discussed are subject to the dynamics of the rivers, i.e., their floristic compositions are influenced mostly by the height and duration of inundations. Beginning with Glycerietum maximae. The associations of periodically flooded meadows can be arranged in an ecological series of decreasing humidity. From the associations encountered, those belonging to Phragmitetalia and Magnocaricetalia are found throughout central Europe, while most of the Molinietalia associations are members of the Cnidion venosi alliance characteristic for continental Europe. The species of Cnidion venosi need alternating inundations and dry soil conditions during the year. Among the driest associations in the ecological series are Silaetum pratensis and especially Serratulo-Festucetum commutatae, both members of the Molinion coeruleae alliance. Soil samples from the associations studied were analyzed to a depth of 35 cm.--Copyright 1976, Biological Abstracts, Inc.
W76-09076

HYDROTHERMIC REGIME AND PRODUCTIVITY OF FORESTS OF NATURAL ORIGIN, (IN RUSSIAN),
For primary bibliographic entry see Field 2I.
W76-09080

EFFECT OF THE MOZHAYSK RESERVOIR ON SOIL OF THE BANK AREA OF THE SURROUNDING TERRITORY, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
For primary bibliographic entry see Field 2G.
W76-09081

MEADOW VEGETATION AND FORAGE RESOURCES OF THE URAL RIVER FLOODPLAIN, (IN RUSSIAN)
E. A. Ageleuv.
Izv Akad Nauk Kaz SSR Ser Biol 13(1), p 8-16, 1975.

Descriptors: *Vegetation, Meadows, Flood plains, *Forage, Rivers.
Identifiers: Steppe, *USSR(Ural River flood plain).

Investigations of the floodplain meadows of the Ural River were carried out in 1962-1971. The Ural floodplain is divided into 6 geobotanical regions: upper steppe, middle steppe, interplatform middle steppe, near-Caspian steppe, near-Caspian desert Ural and delta floodplain. A classification of the Ural floodplain meadows is presented. In all, 153 associations were noted, which are combined into 36 formations belonging to 3 classes: steppe, true and marshy. The forage characteristics of the meadows are described. There is a need to develop a system of measures aimed at the improvement and rational use of the floodplains in connection with the construction of the Volga-Ural canal and diversion of part of the runoff of Siberian rivers to western Kazakhstan (USSR).--Copyright 1975, Biological Abstracts, Inc.
W76-09098

HYDROLOGIC UNIT MAP--1974, STATE OF MINNESOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-09131

STATISTICS OF DATA TRANSFER,
Geological Survey, Reston, Va.
N. C. Matalas, E. Todini, and J. R. Wallis.
In: Hydrological Network Design and Information Transfer; Proceedings of international seminar, held at Newcastle upon Tyne, U K, August 19-23, 1974: World Meteorological Organization Operational Hydrology Report No 8 (WMO No 433), p 103-109, 1976. 2 tab, 7 ref.

Descriptors: *Streamflow forecasting, *Regression analysis, *Statistical methods, Analytical techniques, Data collections, Equations, Sites, Estimating.
Identifiers: *Data transfer, Information transfer.

In water resources investigations, extensive use is made of statistical parameters, such as the mean and variance that characterize streamflow. Given two sites, one with a longer length of record than the other, but where the records are to some extent concurrent, information may be transferable from the long-term to the short-term site. An analytical technique of information transfer is outlined, and the use of the technique as a network design tool is illustrated. Discussion is limited to estimating the mean. (Woodard-USGS)
W76-09133

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1974 IN DADE COUNTY FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-09135

SEDIMENT TRANSPORT, TURBIDITY, CHANNEL CONFIGURATION, AND POSSIBLE EFFECTS OF IMPOUNDMENT OF THE MAD RIVER, HUMBOLDT COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W76-09136

A TECHNIQUE FOR ESTIMATING THE TIME OF TRAVEL OF WATER IN INDIANA STREAMS,
Geological Survey, Indianapolis, Ind.
S. E. Eikenberry, and L. G. Davis.
Available from National Technical Information Service, Springfield, Va 22161, as PB-251 934 as printed copy, $4.00, microfiche $2.25. Water-Resources Investigations 76-9, March 1976. 39 p, 19 fig, 3 tab, 13 ref.

Descriptors: *Path of pollutants, *Streams, *Indiana, *Travel time, *Forecasting, Analytical techniques, Streamflow, Solutes, *Flow rates, Channel morphology, Flow characteristics, Equations.

Estimates of the traveltime of waterborne particles in streams is important for pollution studies and in the event of spills of contaminants. This report provides data for the 16 Indiana streams on which time-of-travel information has been obtained and a means for estimating the velocity of any naturally flowing stream in Indiana with a drainage area of 80 square miles (210 square kilometres) or more. Measured velocity rates compiled from the time-of-travel data are related to 25, 50, 100, and 200 percent of the average discharge of streams. Velocities at these discharges are significantly related to their respective watershed characteristics (average discharge and slope). Generalized relations of the velocities as functions of the streams' watershed characteristics are developed as multivariate regression equations using the data from each of the measured streams. Examples of uses and applications of the measured data and the predictive equations are given. (Woodard-USGS)
W76-09138

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 7C.
W76-09145

LOW-FLOW CHARACTERISTICS AND MEAN ANNUAL DISCHARGE OF NORTH BRANCH MANITOWOC RIVER AT POTTER, WISCONSIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 7C.
W76-09147

WATER RESOURCES OF WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
C. A. Pascale.
Available from Florida Dept. of Natural Resources, Tallahassee, for $1.39. Florida Bureau of Geology, Tallahassee, Report of Investigations No 76, 1974. 65 p, 28 fig, 8 tab, 15 ref, append.

Descriptors: *Groundwater resources, *Surface waters, *Water quality, *Water supply, *Florida, Hydrologic data, Aquifer characteristics, Hydrogeology, Streamflow, Water utilization, Water wells, Water level fluctuations.
Identifiers: Walton County(Fla).

Walton County is an area of about 1,140 sq mi in northwestern Florida. Total water use in 1970 averaged about 13.2 mgd of which 12.7 mgd was from the Floridan aquifer. Water used for irrigation averaged 10 mgd and exceeded all other uses. The Floridan aquifer underlies all of Walton County and is the primary source of water supply. It is an important hydrogeologic unit because of its capacity to store water and to maintain streamflow. The transmissivity of the Floridan aquifer is highly variable and ranges from 4,000 gpd/ft along the gulf coast to 180,000 gpd/ft in southeastern Walton County. Dissolved solids of water from wells range from 70 to 3,500 mg/litre; chlorides vary to a maximum of about 2,000 mg/litre. Groundwater pumpage for irrigation in 1970 in southeastern Walton County caused water levels there to decline more than 80 feet. Total discharge of streams originating in Walton County averages about 1.0 bgd; minimum discharge during dry spells is about 300 mgd. Although most streams yield copious amounts of good quality water, none are used for water supply. (Woodard-USGS)
W76-09149

WATER DIVERSION AND THE MORATORIUM,
Washington Univ., Seattle. School of Law.
R. W. Johnson.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p. 39-62. 35 ref., 3 append.

Descriptors: *Interstate, *Inter-basin transfers, *Legal aspects, *Water policy, Water rights, Southwest U.S., Rocky Mountain region, Pacific Northwest U.S., Legislation, State governments, Federal government, Judicial decisions, Interstate compacts, Colorado River basin, Columbia River.

While the question of Congressional legislation on interstate basin transfers of water has been deferred in 1968 for ten years, partially to allow the National Water Commission to study the nation's water requirements, the needs for large quantities of water to develop oil shale and coal deposits in the Rocky Mountain area, to resolve increasing salinity in the Colorado River basin, and to rescue large agricultural and urban communities in the Southwest, especially in Arizona and Texas, focus on federal legislation and a break with past policies and new approaches to the evaluation of proposals for major interbasin transfers. Discussed are Supreme Court decisions as they relate to congressional power to legislate interstate transfers, the states' rights of veto, the Senate's reaction to proposed Columbia River diversion to the Southwest, equitable treatment for areas of water origin, the environmentalists' impact on such transfers, and transfers from Canada to the United States. It is suggested that if a major advantage to the nation would accrue, with only a minor cost to the Pacific Northwest, or other areas of origin, then such transfers should go forward, with appropriate compensation to the area of origin for its losses. The National Water Commission's recommendations would permit an objective and realistic evaluation of this issue. (See also W76-09230) (Auen-Wisconsin).
W76-09234

PROTECTION OF FREE-FLOWING RIVERS,
Oregon State Univ., Corvallis. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W76-09235

AN EVALUATION OF ERTS DATA FOR OCEANOGRAPHIC USES THROUGH GREAT LAKE STUDIES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2H.
W76-09244

EVALUATION OF A MONTHLY WATER YIELD MODEL,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W76-09246

A THEORY OF FLOW RESISTANCE FOR VEGETATED CHANNELS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
G. T. Thompson, and J. A. Roberson.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 2, p 288-293, March-April 1976. 5 fig, 12 ref.

Descriptors: *Model studies, *Channel flow, *Flow resistance, Mathematical models, Drag, Vegetation, Roughness(Hydraulic), Flow, Viscosity, Fluid mechanics, Fluid friction, Hydraulics.
Identifiers: Vegetated open channels.

A theory was developed to predict the flow resistance in vegetated open channels. The solution technique was based on an analytical method

originally proposed by Roberson for smooth conduits roughened with discrete submerged roughness elements. Flow conditions may either partially or fully submerge the cylinders. Included in the analysis is a method to predict the effect of flexible vegetation on flow resistance. The model also predicts resistance effects of a smooth boundary or one roughened by dense concentrations of small elements such as soil particle aggregates. An initial comparison of flume measurements of resistance for small diameter cylinders was given. The analytical model provides, in addition to resistance factor, other flow parameters involved in analytical solutions of vegetated open channel flow. (Sims - ISWS)
W76-09252

UNIT HYDROGRAPHS - A COMPARATIVE STUDY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W76-09254

DRAINAGE SYSTEM EFFECTS ON PHYSICAL PROPERTIES OF A LAKEBED CLAY SOIL,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W76-09259

QUANTITATIVE ASSESSMENT OF CHANGES IN URBAN RUNOFF,
Texas Univ. Health Science Center, Houston. School of Public Health.
For primary bibliographic entry see Field 4C.
W76-09267

4B. Groundwater Management

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W76-08889

TECHNIQUES OF SHALLOW WELL DRILLING,
Layne Atlantic Co., Norfolk, Va. Water Resources Div.
For primary bibliographic entry see Field 8B.
W76-08891

GROUND WATER PROBLEMS ASSOCIATED WITH WELL-DRILLING ADDITIVES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08902

MOBILITY OF WELL-DRILLING ADDITIVES IN THE GROUND WATER SYSTEM,
National Water Well Association, Worthington, Ohio. Research Facility.
For primary bibliographic entry see Field 5B.
W76-08904

MOVEMENT OF CHEMICAL CONTAMINANTS IN GROUND WATER,
Dames and Moore, Park Ridge, Ill.
For primary bibliographic entry see Field 5B.
W76-08905

OBJECTIVES OF WELL-DRILLING REGULATIONS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W76-08917

MODELS FOR EVALUATION OF FRESH-WATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 4A.
W76-08921

HYDROGEOLOGICAL CONDITIONS OF AL-HAMAD AREA, IRAQ,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2F.
W76-09068

A PRELIMINARY WATER AND ENERGY BUDGET ANALYSIS OF MONTEZUMA WELL, ARIZONA,
Arizona State Univ., Tempe.
A. J. Brazel.
Journal of the Arizona Academy of Science, Vol. 11, No. 1, p. 9-15, February, 1976. 6 fig, 3 tab, 5 ref, 1 append.

Descriptors: *Hydrologic budget, *Energy budget, *Artesian wells, *Microclimatology, *Heat balance, Inflow, Discharge(Water), Water loss, Subsurface investigations, Water temperature, Air temperature, Vapor pressure, *Arizona.
Identifiers: *Montezuma Well(Ariz), Montezuma Castle National Monument(Ariz), Verde Basin(Ariz), Beaver Creek(Ariz).

A study was made of the energy and water budget and surrounding microclimate of Montezuma Well, a thermal artesian well in the Verde Basin of Central Arizona. For a 30-hour period in early November, the mean air temperature was 10 C (0.3 C cooler than the mean daily temperature at nearby Montezuma Castle National Monument). The largest heat flux was that associated with inflow and outflow (over 2,000 lys/day), although the net difference was only 187 lys/day. Very little water loss is via the irrigation ditch draining into Beaver Creek. Air in the well depression remains cooler during the day and slightly warmer at night than the surrounding desert, the well rim being the warmest site. Vapor pressure deficits during the day were much greater over the desert and rim sites than the well site. Such variations are partly a function of the well's vapor flux. Temperatures must vary greatly within the well environment, mostly due to slope and exposure characteristics of the cliff walls, and apparently correspond to plant cover variations. The well's late fall energy budget seems to be a balance between net radiation and evaporation, and between net energy gain from inflow-outflow and loss of sensible heat to the atmosphere by conduction and convection. (Jahns-Arizona)
W76-09072

PROTECTION OF ROMANIAN UNDERGROUND WATER FAUNA, (IN ROMANIAN),
Academia R. S. R., Cluj. Institutul de Spelologie.
For primary bibliographic entry see Field 2I.
W76-09085

GROUND-WATER LEVELS AND CHEMICAL QUALITY OF GROUND WATER IN LINCOLN, MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 7C.
W76-09132

HYDROLOGIC ENVIRONMENTAL EFFECTS OF SPRAYED SEWAGE EFFLUENT, TALLAHASSEE, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-09134

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1974 IN DADE COUNTY FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W76-09135

THE EFFECTS OF GROUND-WATER DEVELOPMENT ON THE WATER SUPPLY IN THE POST HEADQUARTERS AREA, WHITE SANDS MISSILE RANGE, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W76-09137

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--CALIFORNIA REGION,
Geological Survey, Reston, Va.
H. E. Thomas, and D. A. Phoenix.
Available from Supt. of Documents, GPO, Wash., D.C., 20402, price $2.30. Professional Paper 813-E, 1976. 51 p, 14 fig, 1 plate, 12 tab, 135 ref.

Descriptors: *Groundwater resources, *Surface waters, *Water quality, *Available water, *California, Reviews, Evaluation, Water supply, Water demand, Water utilization, Hydrogeology, Land subsidence, Water pollution sources.
Identifiers: California Region.

Most people in the California Region live in a semiarid or arid climate, with precipitation less than the potential evapotranspiration--environments of perennial water deficiency. However, water from winter rain and snow can be stored for use during the dry summer months, and water stored during a wet climatic period can be used in a succeeding dry period; moreover, perennial deficiency can be overcome by bringing water from areas of perennial surplus. Nearly all the groundwater reservoirs of the California Region are in alluvial sediments of valleys and plains that flank the mountain ranges. The largest, underlying the vast Central Valley, occupies 10 percent of the area of the region, has an estimated usable capacity exceeding 100 million acre-feet (125 cubic kilometres), and has an annual pumpage from wells of about 13 million acre-feet (16 cubic kilometres). For more than half a century the California Region has led all others in North America in pumping of groundwater as well as in the area, variety, yield, and export of crops irrigated by water from wells. (Woodard-USGS)
W76-09139

GROUND-WATER DATA FOR SUNFLOWER COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09140

GROUND-WATER DATA FOR CARROLL COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09141

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN CHAMBERS, LIBERTY, AND MONTGOMERY COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09144

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN SELECTED COAL-ENERGY AREAS OF UTAH,
Geological Survey, Salt Lake City, Utah.
K. M. Waddell.

Open-file report, April 1976. 21 p, 5 fig, 2 tab, 12 ref.

Descriptors: *Environmental effects, *Coal mines, *Water resources, *Utah, Water pollution sources, Water quality, Surface waters, Groundwater, Sediments, Data collections, Water demand, Water wells.

Planned coal development in Utah in the next decade includes thermal-electric and coal gasification plants and slurry pipelines with estimated water requirements that may exceed 200,000 acre-ft (246.6 cubic hectometres) annually. The U.S. Geological Survey presently maintains a minimal monitoring program on streams and wells in the coalfield areas. The program consists of 116 stream-gaging stations, 18 at which chemical-quality data are obtained and 14 at which sediment data are obtained. The groundwater monitoring program consists of 170 wells for water-level monitoring and 16 wells at which samples are obtained for chemical analysis. Five areal water-resources studies are being made in the vicinity of Utah coalfields. The principal study where coal mining is most active is in the Wasatch Plateau-Book Cliffs area. This is a 2-year hydrologic reconnaissance designed to provide an assessment of the current hydrology, which will aid in the solution to some of the potential problems that may occur as a result of coal-energy development. (Woodard-USGS)
W76-09148

WATER RESOURCES OF WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-09149

HYDROLOGIC CONCEPTS OF ARTIFICIALLY RECHARGING THE FLORIDAN AQUIFER IN EASTERN ORANGE COUNTY, FLORIDA--A FEASIBILITY STUDY,
Geological Survey, Columbus, Ohio.
D. D. Knochenmus.
Available from Florida Dept. of Natural Resources, Tallahassee, for $1.17. Florida Bureau of Geology, Tallahassee, Report of Investigations No 72, 1975. 36 p, 14 fig, 2 tab, 17 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Underground storage, *Water management(Applied), *Florida, Methodology, Aquifer characteristics, Artesian aquifers, Confined water, Hydrologic systems, Water wells, Transpiration control, Hydrologic cycle, Water table, Water quality, *Feasibility studies.
Identifiers: *Floridan aquifer(Fla), Orange County(Fla).

In east Orange County, Fla., the hydrologic system cycles about 55 inches of rainfall per year of which 10 to 15 inches run off, 40 to 45 inches evapotranspire, and 0 to 2 inches recharge the Floridan (artesian) aquifer. The water level in the nonartesian aquifer is at, or near, land surface and as much as 30 feet above the potentiometric surface of the Floridan aquifer. Little downward leakage (recharge) takes place because the nonartesian aquifer is separated from the Floridan aquifer by a thick sequence of clayey sands. The supply of water for artificially recharging the Floridan aquifer with a network of optimally designed and spaced connector wells (wells that tap both the nonartesian and Floridan aquifer) would be derived from the capture of potential water losses--evapotranspiration and runoff. Water would drain from the nonartesian aquifer into the Floridan aquifer and lower the water table. Lowering of the water table would reduce evapotranspiration losses and provide storage capacity for rainfall that would otherwise run off. (Woodard-USGS)
W76-09150

DETERMINATION OF THE HYDRAULIC CONDUCTIVITY - DRAINABLE POROSITY RATIO FROM WATER TABLE MEASUREMENTS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W76-09249

HYDROLOGICAL PROBLEMS ASSOCIATED WITH DEVELOPING GEOTHERMAL ENERGY SYSTEMS,
Geological Survey, Denver, Colo.
R. H. Pearl.
Ground Water, Vol. 14, No. 3, p 128-137, May-June 1976. 3 fig, 52 ref.

Descriptors: *Geothermal studies, *Groundwater, *Hydrologic aspects, *Energy, Thermal properties, Thermal springs, Wells, Thermal water, Geology, Groundwater movement, Hydrogeology, Recharge, Porosity, Permeability, Water demand, Legal aspects.
Identifiers: *Geothermal energy, Geothermal systems.

Geothermal energy - the naturally occurring heat of the earth's crust - has been used since earliest time by man for a variety of purposes. In recent times, wells have been drilled in close proximity to surface indicators of geothermal heat in an attempt to utilize this resource. The steam or hot water obtained from these wells has been used for agricultural and recreational purposes, to heat buildings, and to generate electricity. It has been estimated that by the year 2000 between 30,000 Mw and 395,000 Mw of electricity can be generated in the United States with naturally occurring steam. At present, and probably for years to come, the primary geothermal exploration efforts will be aimed at discovering and developing high-temperature hydrothermal systems to be used for generation of electricity. Typical problems that will be encountered in the exploration and development of such systems are: (1) defining the type of hydrothermal system under investigation; (2) groundwater flow direction, whether it is vertical or horizontal; (3) recharge rates and areas; (4) porosity and permeability determination; (5) water needs and consumptive usage; (6) disposal of waste fluids; and (7) legal and institutional considerations. A discussion of each problem area was presented. In order to solve many of these problems at the outset, it is believed that the geohydrologist should be an essential member of the exploration team. (Sims - ISWS)
W76-09260

SUBSURFACE BRINE DISPOSAL - BE REASONABLE,
Engineering Enterprises, Inc., Norman, Okla.
For primary bibliographic entry see Field 5B.
W76-09261

PRIVATE WELLS PROVE TO BE A BETTER BUY,
Ground Water Age, Vol. 10, No. 8, p 21-22, April, 1976.

Descriptors: *Water rates, *Pricing, *Cost comparison, Amortization, Water wells, Nebraska.
Identifiers: *Domestic wells, Rural water systems.

Rancher Kenneth Schroeder of Wakefield, Nebraska undertook a detailed two year water use study and proved that private wells can provide water more economically than central rural water systems. Schroeder saves approximately $500 annually by supplying his own water. This figure will vary depending on the abundance of good quality water. (Gass-NWWA)
W76-09343

INTACT MANURE PACK HALTS SEEPAGE,
For primary bibliographic entry see Field 5G.
W76-09344

COUNTERMEASURES TO CONTROL OIL SPILLS IN WESTERN CANADA,
EBA Engineering Consultants Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5G.
W76-09346

THE AVAILABILITY OF GROUND WATER FOR IRRIGATION IN THE RICE LAKE-EAU CLAIRE AREA, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
E. A. Bell, and S. M. Hindall.
Wisconsin University Extension, Madison, Geological and Natural History Survey, Information Circular Number 31, 1975. 65 p, 33 fig, 4 tab, 30 ref.

Descriptors: *Groundwater, *Irrigation water, *Glacial drift, *Sandstones, Irrigable land, Soil environment, Soil moisture, Aquifers, Permeability, Water wells, Irrigation wells, Groundwater recharge, Dissolved solids, Calcium compounds, Boron, *Wisconsin.
Identifiers: *Rice Lake-Eau Claire area(Wis), Red Cedar river valley(Wis), Lower Chippewa river valley(Wis), Menomonie area(Wis), Cameron area(Wis), Dunn County(Wis).

An abundance of ground water of excellent chemical quality for irrigating crops is available from glacial outwash sand and gravel and from the underlying sandstones in the Rice Lake-Eau Claire area. Thick deposits of glacial outwash sand and gravel in the valleys of the Red Cedar and lower Chippewa Rivers yield more than 1,000 GPM (63 litres per second) to many wells. Large tracts of irrigable soils, delineated in two subareas (Rice Lake and Cameron) in Barron County and one subarea (Menomonie) in Dunn County, lie within the outwash plains where ground water is available in large quantities. Yields are especially large in the Rice Lake and Cameron subareas where the sand and gravel is highly permeable and the thickness of saturated aquifer exceeds 250 feet (75 metres). Yields generally are less than 1,000 GPM (63 litres per second) in the Menomonie subarea where large amounts of clay locally reduce the permeability of the aquifer and the thickness of saturated aquifer is less than 200 feet (60 metres). Adequate water for irrigation is available also from sandstone underlying the glacial outwash plains. Because the two aquifers generally are connected hydraulically, wells penetrating the sandstone also withdraw water indirectly from the glacial drift. Most irrigation wells in Barron County withdraw water from glacial outwash; more than half the irrigation wells in Dunn County withdraw water from sandstone. In most years, recharge to the ground-water reservoir is 6 to 8 inches (150 to 200 millimetres), which is more than ample to sustain pumping for irrigation without lowering the water table significantly. (Heiss-NWWA)
W76-09348

WATER MONITORING - JIM BRIDGER PROJECT - SWEETWATER COUNTY, WYOMING,
Fox (F. M.) and Associates, Inc., Wheat Ridge, Colo.
For primary bibliographic entry see Field 5A.
W76-09349

APPLICATION OF GROUND-WATER FLOW THEORY TO A SUBSURFACE OIL SPILL,
Geological Survey, Menlo Park, Calif. Engineering Geology Branch.
For primary bibliographic entry see Field 2L.
W76-09350

THE ROLE OF GROUND WATER.
For primary bibliographic entry see Field 2F.
W76-09353

COST ESTIMATION.
Ground Water Age, Vol. 10, No. 5, p 23, 26, January, 1976. 1 fig.

Descriptors: *Cost analysis, *Estimated costs, *Operating costs, Annual costs, Water wells.
Identifiers: *Drilling cost estimation, Criteria for cost estimation.

Water well drillers should be able to approximate the drilling difference based on various types of formations in order to arrive at cost figures which will give him a profitable operation. Terrain and road conditions, drilling rig parts accessibility, labor, as well as fuel and lubrication costs are all important considerations to a drilling job budget sheet. An example is given based on a 2,000 hour per year operation. The 2,000 hours are divided into a determination of yearly rig cost ($10,000.00 per year) to yield a cost per hour figure of $5.00. Next an estimation of average footage drilled per hour must be made. In the example, a rate of 2 feet per hour is given. The footage figure is then divided into the cost per hour giving the cost per foot of the well drilled. Using the above figures, a driller can estimate charges for his services. (Heiss-NWWA)
W76-09354

WATER FOR THE IVORY COAST.
For primary bibliographic entry see Field 8C.
W76-09355

CATHODIC PROTECTION WELLS AND GROUND WATER POLLUTION,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W76-09357

MAKING THE WORLD SAFE FOR GROUND WATER,
For primary bibliographic entry see Field 5B.
W76-09360

FUNDAMENTAL GEOLOGIC PRINCIPLES,
For primary bibliographic entry see Field 7C.
W76-09362

4C. Effects On Water Of Man's Non-Water Activities

METHODS OF ESTIMATING RESIDENTIAL LAND USE FOR WATER RESOURCES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Economics.
P. A. Perry.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 956, $4.50 in paper copy, $2.25 in microfiche. Water Resources Research Institute, Rutgers University, New Brunswick, N.J., Partial Completion Report, May 1976. OWRT A-043-NJ(2).

Descriptors: *Land use, Water resources development, *Land development, *Urbanization, Planning, Institutions, Management, Water quality, Cities, Estimating, *New Jersey, *Water supply, Water quality standards, Regulation, Erosion, Runoff, *Safe yield, *Water pollution control.
Identifiers: Lake Hopatcong(NJ), Six Mile Run(NJ).

Land use principles and criteria related to water quality and water resources management are reviewed. Residential land use estimation techniques are presented. Existing and potential residential land uses are analyzed at two water resources in New Jersey. Lake Hopatcong is representative of an existing water resource that has undergone substantial development in the last ten years because of its proximity to population centers. Six Mile Run exemplifies a proposed new water resource that will be subjected to similar but probably even more intense development pressure within the next ten years. Safe yields of surface water supplies are illustrated for Morris County. Residential land use contributions to non-point sources of pollution are generalized. Indirect methods of maintaining water quality standards through land use regulations are outlined. Guidelines for minimization of erosion and runoff and estimates of impervious surface by land use are included. Planned unit (residential) developments are discussed.
W76-08924

THE NATURE AND CAUSES OF DESERTIZATION,
International Livestock Centre for Africa, Addis Ababa (Ethiopia).
H. Le Houerou.
Arid Lands Newsletter (University of Arizona), No. 3, p. 1-7, March, 1976. 1 tab., 88 ref.

Descriptors: *Deserts, *Desert plants, *Ecosystem, *Vegetation effects, *Arid climates, *Rainfall disposition, Arid lands, Ecological distribution, Resources development, Land management, Droughts, Grazing.
Identifiers: *Desertification, Climatic change, Desertization.

Differentiation is made between true climatic deserts (e.g. Tenere, Libyco-Egyptian and Arabic Sinai) and man-made deserts which occur in arid zones. Desertization is the extension of desert-like conditions to areas not climatologically appropriate, thereby reducing the ecumene. Expansion of deserts on their margins is due to continuous human encroachment on fragile and unstable ecosystems and faulty management of natural resources. Desertization varies in time with the recurrence of prolonged droughts but is curtailed during a series of abnormally rainy years. Spatial variation depend on the density of human and animal population, which in turn is linked to water availability; thus, areas with better water conditions experience the most acute desertization. Several authors have suggested that climatic fluctuations may result from increasing quantities of dust released into the atmosphere thousands of miles from the area of origination. Such dust clouds might reduce rain-producing clouds. Decreasing organic decay products, in the large drought-stricken areas of the Sahel and East Africa, may have reduced ice-forming biogenic nuclei, thus limiting precipitation and causing feedback self-catalyzing mechanism to desertization. Simulation model studies suggest that an increase in albedo due to diminished vegetative cover also may lessen rainfall and create a feedback mechanism, reinforcing desertization. (Jahns-Arizona)
W76-09069

THE SAHEL: TIME FOR A NEW APPROACH,
The OECD Observer, No. 79, Jan.-Feb., 1976. 7 p, 1 fig, 4 tab. (Some details selected from 'The Economic Impact of Drought and Inflation in the Sahel' by Dr. Elliot Berg, University of Michigan).

Descriptors: *Droughts, *Environmental effects, *Environmental control, *Economic impact, Water resources development, *Land development, Arid lands, Productivity, Water management, *Africa, Moisture deficit, Regional development, Planning.
Identifiers: *Sahel, Club des Amis du Sahel.

Long years of drought and underdevelopment have intensified the ecological and economic plight in five of six Sahel nations (Senegal being the exception). These countries depend heavily on rainfall for adequate agricultural production, animal pasturage and staple food output. The ecological balance is very fragile; even minor variations in rainfall involve magnified consequences. Obstacles to economic expansion include limited resources, trained personnel and organizational and management capacities, along with inadequate knowledge of the environment, especially its agricultural potential. Drought impacts have been great in topsoil destruction and permanent yielding of vegetation to sand, with a resultant ecosystem imbalance. Reversible impacts include reductions in agricultural productivity and herd sizes and the general economic decline. The newly formed 'Club des Amis du Sahel' aims to expand intra-Sahel cooperation toward greater human and natural resource development. Under-utilized river basins and areas being freed from the threat of disease are opening new land with more fertile soil and important ground and surface water resources. (Jahns-Arizona)
W76-09070

MODERN STATE OF THE VEGETATION IN THE DONBAS SMALL RIVER BASINS AND ITS ANTIEROSIVE AND WATER-PROTECTIVE ROLE, (IN UKRANIAN)
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
V. S. Tkachenko.
Ukr Bot Zh. 32(1), p 65-70, 1975.

Descriptors: *Vegetation, River basins, *Erosion control, Water conservation, Preservation, Cultivation, Forest management, Meadows.
Identifiers: Steppe, USSR(Donbas).

A brief description is presented of the present state of the Donbas (USSR) natural vegetation which resulted from geobotanical studies in the basins of the rivers Kazenyi Torets, Bakhmutka, Lugan and Krynka. Steppes, rocky exposures, forests, floodplain meadows and cultivated plants are described and their importance for erosion protection, for water protection and formation of the environment emphasized. These properties of the natural vegetation are lost to a considerable extent. This resulted from changes introduced by human activities.--Copyright 1976, Biological Abstracts, Inc.
W76-09096

VEGETATION AND LANDSLIDES, (IN FRENCH),
Toulouse-3 Univ. (France). Lab. of Botany and Biogeography.
M. Lorillard.
Bull Soc Hist Nat Toulouse. 110(1/2), p 88-92, 1974.

Descriptors: *Vegetation, *Landslides, Europe, Aquatic plants, Erosion control, *Erosion.
Identifiers: Alnus-Glutinosa, *France(Garonne-Ariege Rivers), Quercus-Ilex, Quercus-Pedunculata, Quercus-Pubescens, Quercus-Sessiliflora, Robinia-Pseudoacacia.

The relationship between landslides and vegetation along the Garonne and Ariege River S of Toulouse (France) was studied. Characteristic flora included Quercus sessiliflora, Q. pedunculata, Q. pubescens, Q. ilex, Alnus glutinosa, Robinia pseudoacacia and associated plant life. The natural imbalance due to human interference and resulting natural phenomena such as erosion are discussed. The importance of protective measures was emphasized.--Copyright 1975, Biological Abstracts, Inc.
W76-09101

PRE-IMPOUNDMENT SITE PREPARATION: A STUDY OF THE EFFECTS OF TOPSOIL STRIPPING ON RESERVOIR WATER QUALITY,
P. G. Campbell, B. Bobee, A. Caille, M. J. Demalsy, and P. Demalsy.

Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1768-1777, 1975. 5 fig., 1 tab., 18 ref.

Descriptors: *Nitrogen, *Carbon, *Phosphorous, Water quality, Aquatic algae, Water chemistry, *Topsoil, *Soil management, *Reservoirs, Impoundments, Impounded waters, Primary productivity, Leaching, Methodology, *Canada, *Pre-impoundment, Applachian Mountain Region.
Identifiers: Bulstrode River, Quebec.

The immediate effect of topsoil stripping is to reduce or eliminate the influence of submerged soil on the overlying water. Nutrient concentrations (C,N,P) and biological activity are particularly affected, being significantly higher in experiments containing topsoil samples. The rate of stabilization of the latter systems, i.e. the rate at which the quality of the overlying water approaches that of the stripped medium is a function of the prevailing environmental conditions; under conditions of forced aeration and dominant heterotrophic activity. The effects of stripping are short-lived. Under normal conditions, effects persist longer. (Katz)
W76-09117

A GUIDE TO STATE PROGRAMS FOR THE RECLAMATION OF SURFACE MINED AREAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5G.
W76-09142

THE EFFECT OF ROAD DEICING SALTS ON SODIUM CONCENTRATION IN AN URBAN WATER COURSE,
York Univ., Downsview (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W76-09218

NORTHERN GREAT PLAINS RESOURCE PROGRAM. SURFACE RESOURCE WORK GROUP--REGIONAL PROFILE.
Northern Great Plains Resource Program, Denver, Colo.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-243 152, $18.75 in paper copy, $2.25 in microfiche. Report NGPRP/CD-74/400, February 1974. 761 p. 31 fig., 130 tab., 63 ref.

Descriptors: *Great Plains, *Natural resources, *Coal mines, *Mining, *Land reclamation, Montana, Nebraska, North Dakota, South Dakota, Wyoming, Land resources, Land use, Soils, Vegetation, Fish, Wildlife, Recreation, Agriculture, Scenery, Land tenure, Forestry, Economic aspects, Conservation, Ranges, Hunting, Wetlands, Waterfowl, Big game, Game birds, Lignite, Bentonite, Strip mines, Ecosystems.

The land, its uses and ownership; soils; vegetation; fish and wildlife; recreation facilities; agriculture; wilderness; scenery and forest products in Montana, Nebraska, North and South Dakota, and Wyoming, are identified and constraints affecting their development described in relation to the impacts on these resources of coal development. Much of the surface and subsurface ownership is fragmented; forests and woodlands comprise about 4% of the area with only 13 counties supporting about 2.19 billion cu ft of growing stock. A large part of the economy depends upon agriculture, with pastureland and rangeland representing the largest land use. Annual forage production is estimated and the ranges' suitability as wildlife habitat and corresponding wildlife values are described. Soil associations describe the landscape, geology, climate, vegetation, current use, and general productivity potentials and limitations; several important soil properties and interpretations of performance are presented with regard to their suitability for surfacing mine spoils. The vegetation inventory was oriented to the soil associations and the plant communities represent the ecological potential for the sites. The area is outstanding for large game and game birds, with relatively low hunting pressures, but provides appreciable income and recreation. The potentially valuable commercial fishery is presently limited because of market conditions. The scenery resource is described by physical subdivisions. The single most important factor in successful rehabilitation of mined lands is the amount and distribution of precipitation. The region contains an estimated 440 billion tons of lignite but the coalbeds are discontinuous and vary greatly in thickness. Land rehabilitation by existing mining operations is discussed. (Auen-Wisconsin).
W76-09228

PHASE I: AREA DESCRIPTION,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09239

QUANTITATIVE ASSESSMENT OF CHANGES IN URBAN RUNOFF,
Texas Univ. Health Science Center, Houston. School of Public Health.
I. Cech, and K. Assif.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR1, Proceedings Paper 11957, p 119-125, March 1976. 4 fig, 12 ref, 1 append. NSF GI 39211.

Descriptors: *Urban runoff, *Coastal plains, *Drainage, *Texas, Floods, Hydrology, Maps, Surface drainage, Gulf Coastal Plain, Urbanization, Storm runoff, Runoff, Land use, Computers, Frequency analysis, Hydrologic budget.
Identifiers: Coastal zone, Flood estimate, Flood plain studies, Synographic mapping, Trend surface analysis.

The detection and quantitative assessment of the magnitude of man-induced changes in flood regimes in part of the Texas Gulf Coast were made using the method of trend surface analysis of distribution of storm runoff. The procedure incorporated the elements of frequency analysis and two- and three-dimensional synographic computer mapping. The natural geographic tendency in runoff distribution typical for the study area was compared with the runoff pattern induced by urbanization. The range of differences between urban and nonurban runoff found in this study was proposed as a guide for development planning in the coastal territories that are now primarily rural. (Roberts - ISWS)
W76-09267

PUMPS.
For primary bibliographic entry see Field 8C.
W76-09351

4D. Watershed Protection

SOIL AND WATER CONSERVATION WITH WESTERN IOWA TILLAGE SYSTEMS,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
R. G. Spomer, R. F. Piest, and H. G. Heinemann.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 108-112, January-February 1976. 2 fig, 3 tab, 11 ref.

Descriptors: *Soil conservation, *Water conservation, *Erosion control, *Cultivation, *Farm management, *Iowa, Runoff, Precipitation(Atmospheric), Rainfall, Crops, Corn(Field), Grasses, Terracing, Erosion rates, Cultivated lands, Sheet erosion, Soil erosion, Watersheds(Basins), Agricultural watersheds, Agricultural runoff, Agriculture.

Excessive rates of surface runoff and erosion from the research watersheds at Treynor, Iowa, were measured during a 10-yr study of two contour-planted watersheds cropped to corn. Low erosion rates occurred at a similarly cropped level-terraced watershed and from a bromegrass watershed. These measurements showed that level terraces and bromegrass are exceptionally effective conservation practices. But level terraces with point rows and irregular fields complicate farming and decrease farm machinery efficiency, and grass is not considered one of the more profitable crops for western Iowa loess soils. Mulch-tilled corn was also examined to assess its effect on surface runoff and soil loss. On one watershed, mulch tillage was used with parallel terraces (double normal spacing). The terrace-impounded water was removed by an underground drainage system, installed in the spring of 1972. The contour-planted watersheds lost more soil than the mulch-tilled, parallel-terraced watershed in 1972. (Sims-ISWS)
W76-08805

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W76-08840

DEVELOPMENT OF A MATHEMATICAL MODEL OF INFILTRATION WHICH INCLUDES THE EFFECTS OF RAINDROP IMPACT,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 2G.
W76-08844

EVALUATION OF A MONTHLY WATER YIELD MODEL,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W76-09246

WIND EROSION: THE PROTECTIVE ROLE OF SIMULATED STANDING STUBBLE,
Agricultural Research Service, Manhattan, Kans. North Central Region.
L. Lyles, and B. E. Allison.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 61-64, January-February 1976. 5 tab, 11 ref.

Descriptors: *Wind erosion, *Soil conservation, *Soil erosion, Soils, Crops, Wheat, Sorghum, Corn(Field), Winds, Erosion, Farm management, Agriculture.
Identifiers: Stubble effects.

Wind-tunnel studies indicated that for standing stubble uniformly spaced or in rows normal to wind direction, critical friction-velocity ratios (CFVR) were 1.4 to 2.0 times larger than those for stubble in rows parallel to the wind - the larger the CFVR, the more effective the stubble in preventing wind erosion of the soil. On a weight basis, 5.5 and 8.7 times more standing grain sorghum and corn stubble, respectively, than standing wheat stubble were required to provide the same wind-erosion protection. Equations presented here may be used to determine if soil will erode and the total amount that will erode for a given wind-soil-stubble condition. (Sims-ISWS)
W76-09247

EROSION FOR CORN TILLAGE SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-09248

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES-I. LITERATURE REVIEW,
Geological Survey, Menlo Park, Calif. Water Resources Div.
E. A. Jenne, and P. Avotins.
Journal of Environmental Quality, Vol. 4 No. 4 p 427-431 October-December 1975. 49 ref.

Descriptors: *Mercury, *Water quality, *Sampling, Bacteria, Preservation, *Pollutant identification, Reviews, Water analysis.
Identifiers: *Volatilization, *Literature reviews.

Conflicts in the published findings of adequacy of various preservation treatments for water samples intended for mercury analysis are common and appear to result from variations in (i) biological effects; (ii) initial concentrations of mercury; (iii) types of containers used; (iv) properties of the water or laboratory solution (particularly, the dissolved organic and reduced metal cation content); (v) duration of experiment; (vi) concentration of preservative; (vii) analysis, whether conducted in the original storage container or aliquots taken to another vessel; and (viii) the definition of adequacy employed. Of these variables the biological effects have been overlooked by most investigators. (See also W76-03009) (Skogerboe-Colorado State)
W76-08767

MERCURY CONTENT OF BIOTA IN COASTAL WATERS IN HAWAII,
Hawaii Univ., Honolulu. Pacific Biomedical Research Center.
For primary bibliographic entry see Field 5C.
W76-08776

INSECTICIDE RESIDUES IN TWO TURTLE SPECIES FOLLOWING TREATMENT WITH DDT,
Middle Tennessee State Univ., Murfreesboro. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08778

A CONTINUOUS FLOW BIOASSAY METHOD TO EVALUATE THE EFFECTS OF OUTBOARD MOTOR EXHAUSTS AND SELECTED AROMATIC TOXICANTS ON FISH,
Illinois Univ. at the Medical Center, Chicago. School of Public Health.
For primary bibliographic entry see Field 5C.
W76-08780

OBSERVATION AND MONITORING OF WATER QUALITY BY USE OF EXPERIMENTAL BIOLOGICAL METHODS,
Norsk Institutt for Vannforskning, Blindern.
O. M. Skulberg.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2053-2063, 1975, 5 fig., 2 tab., 17 ref.

Descriptors: *Monitoring, Methodology, *Testing procedures, *Artificial substrates, Water quality, *Biomass, *Benthos, Chemical analysis, *Seston, Trophic level, Bioassay, Pollutant identification, Rivers.
Identifiers: Artificial channels, Selenastrum, *Norway.

Laboratory and field observations indicate that for monitoring purposes, observations of biological populations in analog recipients operated at river stations can furnish important information to supplement results from conventional field methods. Culture experiments with test organisms should be regularly included in comparative investigations of water quality and impact of pollution on aquatic life. (Katz)
W76-08793

TRACE ELEMENT POLLUTION IN STREAMS OF NORTHWESTERN U.S.A.,
K. G. Wood.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 1641-1645, 1975, 2 tab., 5 ref.

Descriptors: *Trace elements, Water chemistry, *Copper, *Zinc, *Cadmium, Aquatic life, *Lead, Methodology, Water analysis, Fluvial sediments, *Pacific Northwest, U.S., Lake Erie, Lake Ontario, *Pollutant identification, Water pollution sources, *Mine wastes, Montana, Idaho.
Identifiers: *Atomic absorption analysis, *Thallium, Couer d'Alene River, Clark Fork.

Atomic absorption analysis was used to detect copper, zinc, cadmium, lead and thallium in streams affected by mill and smelter wastes in Northwestern U.S.A. Analyses were performed on unfiltered water, sediment, biota and on Cladophora suspended overnight at each site. Analysis of sediment and biota proved to be the most reliable evidence of trace element pollution. (Katz)
W76-08797

LABORATORY AND FIELD TESTS OF TEMPERATURE TOLERANCE ON GAMBUSIA A. AFFINIS, THE WESTERN MOSQUITOFISH,
For primary bibliographic entry see Field 5C.
W76-08798

PHOSPHORUS AVAILABILITY IN PARTICULATE MATERIALS TRANSPORTED BY URBAN RUNOFF,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5B.
W76-08804

ISOLATION AND CHARACTERIZATION OF ACTINOPOLYSPORA HALOPHILA, GEN. ET SP. NOV., AN EXTREMELY HALOPHILIC ACTINOMYCETE,
Ottawa Univ. (Ontario). Dept. of Biology; and Ottawa Univ. (Ontario). Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W76-08837

INDICATORS OF AIR AND WATER QUALITY ARE TACKLED BY CEQ FOR CONSISTENCY,
Environmental Science and Technology, Vol. 10, No. 1, p 18-19, 1976.

Descriptors: *Standards, *Indicators, *Air pollution, *Water quality standards, Pollutants, Monitoring.
Identifiers: Air quality index.

Air pollution indices used by American and Canadian agencies are inconsistent in their reporting of air quality conditions. Differences were found in the way indices are calculated, number of pollutants included, reporting manner, and descriptive words used. A federal interagency task force was created to select an urban air quality index and standardize index monitoring and reporting. This index will have many features of the standardized urban air quality index and primary standards index, be based on national ambient air quality standards and federal episode criteria, consider major pollutants separately, be a segmented linear function, and consist of four or more descriptor categories. Air pollution control agencies and news media will use it to report local air quality daily. About 50 water quality indicators are being evaluated to develop a comparative guide. These indices can be broadly classified into single parameter, standards violation, lake quality, biological, perception based, water use, point source, non-point source, and water quality indices/judgmental or empirical multi-attribute indices. Guidelines are being developed to determine the best water quality indicator for a specific purpose. A national inventory of biological monitoring programs is being prepared. Reports of environmental quality indicators and statistics will be published periodically. (Buchanan-Davidson--Wisconsin)
W76-08838

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W76-08840

ENVIRONMENTAL ASPECTS OF THE COOLING SYSTEMS OF THERMAL POWER STATIONS: REPORT ON THE SEMINAR HELD AT ZURICH, MAY CONCLUSIONS AND RECOMMENDATIONS, (LES ASPECTS D'ENVIRONMENT DES SYSTEMS DE REFROIDISSEMENT DES CENTRALLES THERMIQUES),
Economic Commission for Europe (UN), Geneva (Switzerland). Div. of Energy.
For primary bibliographic entry see Field 6G.
W76-08850

A COMPARISON OF AERIAL INFRA-RED AND IN-SITU THERMAL PLUME MEASUREMENT TECHNIQUES,
Wisconsin Univ., Madison.
R. P. Madding, J. V. Tokar, and G. J. Marmer.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 163-186, 17 fig, 3 tab, 3 ref.

Descriptors: *Measurement, *Instrumentation, *Thermal pollution, Analytical techniques, On-site investigations, *Pollutant identification.

The infra-red experiments were conducted from a DC-3 platform. Thermal scans were made with a Texas Instrument RS-18A scanner in the 8- to 14-micrometer range with the data being recorded on analog tape and later digitized. In-situ measurements were made from a 5.5m boat using fast-response thermistor probes. Temperatures were taken at the surface and at 1/2 m intervals from 0.5 to 3 m from the surface. Thermal scanning measures temperatures within only a few tens of microns of the surface, whereas the boat method has the option of measuring at a number of different depths. Thermal scanning offers the capability of generating two orders of magnitude more data in about 1/100th the time required for boat measurements. The aerial infrared monitoring offers a truly synoptic detailed picture of the surface temperature, whereas the boat technique offers a time distorted picture of the plume. Results indicated a good agreement between the two techniques including comparison of general plume configuration, centerline temperature decay, areas contained within isotherm, and point-by-point comparisons. (See also W76-08848) (Chilton-ORNL)
W76-08860

THE SIGNIFICANCE OF ISOMERY IN HYGIENIC STANDARDIZATION OF INDUSTRIAL CONTAMINATIONS OF WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinakii Institut (I) (USSR). Dept. of Public Hygiene.
S. N. Cherkinskii, and V. P. Laskina.

Gig Sanit. 3. 6-10, p 1974.

Descriptors: *Alcohols, *Industrial wastes, Water pollution control, Organic wastes, *Pollutant identification, Toxicity.
Identifiers: *Benzene, Isomery.

Data on comparative hygienic and sanitary-toxicologic features of isomers of 15 organic industrial contaminations (benzene derivatives, alcohols) of water bodies were collected and assessed. Data on 1 of the isomers, as a rule, gives approximate information on the type of action and the level of innocuousness of the others.--Copyright 1975, Biological Abstracts, Inc.
W76-08864

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W76-08889

ACUTE TOXICITY OF WELL-DRILLING TO RAINBOW TROUT,
Environmental Protection Service, Edmonton (Alberta). Aquatic Toxicology Lab.
R. H. Weir, and B. Moore.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 169-182, 4 fig, 4 tab, 4 ref.

Descriptors: *Drilling fluids, *Toxicity, *Bioassay, Fish, Toxins, *Rainbow trout, Canada, Arctic.
Identifiers: *Acute toxicity, 96 hour bioassay test, Potassium chloride, Canadian arctic exploratory well.

The toxicity of drilling muds to rainbow trout was investigated under 96 hour static bioassay test. Samples were taken from a Canadian Arctic exploratory well at various well depths and tested at various concentrations. The drilling-mud concentration which would kill 50 percent of the test population in 96 hours (LC sub 50) was used as the determining factor of the test. It was found that the toxicity could be grouped to its relationship with the mud system and depth at which the sample was taken. Three distinct groups of toxicity were defined. The first group exhibited an LC sub 50 value of less than 20 percent mud concentration by volume. The dominant toxic factor was the high level of potassium chloride used in the surface drilling. The second group exhibited a lack of dominant chemical or physical toxicant, with LC sub 50 values of 36 to 70 percent. The combination of drilling components appeared to cause the toxic action within the mud system. The third toxic group showed LC sub 50 values of 9 to 16 percent concentration by volume. These much higher toxic levels were due to an increase in solids and viscosity associated with weighted muds used for deeper drilling levels. (See also W76-08889) (Heiss-NWWA)
W76-08899

GROUND WATER PROBLEMS ASSOCIATED WITH WELL-DRILLING ADDITIVES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08902

ENVIRONMENTAL IMPLICATIONS OF SEDIMENT BULK ANALYSIS TECHNIQUES FOR TRACE METALS IN OFFSHORE WELL-DRILLING OPERATIONS,
Gulf South Research Inst., New Orleans, La. Dept. of Analytical Chemistry.
J. G. Montalvo, and M. M. McKown.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 357-383, 5 fig. 9 tab, 35 ref.

Descriptors: *Sediments, *Trace elements, *Pollutant identification, Drilling fluids, Benthic Fauna, Biodegradation, Drilling, Offshore platforms, Well.
Identifiers: *Marine sediments, *Trace metals, *Drilling fluid additives, Sediment bulk analysis, Biogeochemical cycle.

Sea bottom sediments underlying well drilling platforms can be sampled in order to monitor trace metal pollution from components of drilling fluid. Increased trace metal levels in the surface sediments during well drilling operations may indicate a pollution problem. Trace metal contaminants from the chemicals used in the well-drilling operations may perturb the marine sediments in the biogeochemical cycle, which can be revealed by chemical analysis for trace metal levels. The analysis (partial or total) must be carefully considered. Trace metals exist in various forms and locations. Analysis must be specifically tailored to each form and location so as to represent meaningful data. There are obvious needs for improved sediment bulk analysis methodology for environmental monitoring and control in offshore well-drilling operations. Many of the principles developed can be applied to other environmental applications requiring bulk sediment analysis for trace metals. (See also W76-08889) (Heiss-NWWA)
W76-08908

A METHOD FOR ESTIMATING THE TOXICITY OF CHLORINATED DISCHARGES,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-08928

PHOTOSYNTHETIC MEASUREMENTS IN THE CENTRAL NORTH PACIFIC: THE DARK LOSS OF CARBON IN 24-HOUR INCUBATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08940

ASSAY OF NITRATE REDUCTASE FROM PLASMOLYZED MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08943

LEUCOTHRIX: ABSENCE OF DEMONSTRABLE FIXATION OF N2,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08953

IMPROVED METHODOLOGY FOR ATP DETERMINATION IN MARINE ENVIRONMENTS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08958

COPEPOD SLICK IN THE NORTHWEST PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08959

SPECIFIC POLLUTANTS IN URBAN WASTE WATERS AND THE EFFICIENCY OF THEIR PURIFICATION (SPETSIFICHESKIE ZAGRYAZNENIYA GORODSKIKH STOCHNYKH VOD I EFFEKTIVNOST' IKH OCHISTKI),
Ya. I. Kostovetskiy, G. M. Rakhov, and E. I. Shteynberg.
Vodosnabzhenie i Sanitarnaya Tekhnika, No. 10, p 34-35, 1975. 1 fig, 2 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Pollutant identification, Heavy metals, Phenols, *Inorganic compounds, Organic compounds, *Organic wastes, *Metals.
Identifiers: USSR.

Waste water samples collected in Donetsk, Chernigov, Krivoy Rog and Voroshilovgrad (USSR) were analyzed for specific organic and inorganic pollutants, and the efficiency of municipal biological waste water treatment plants in the elimination of these pollutants was studied. Phenols, cyanides, thiocyanates, and caprolactam were identified as the major specific organic pollutants. They were almost completely eliminated by biological purification. While tantalum, thallium, arsenic, tungsten, hafnium, indium, lithium, cadmium, cerium, and antimony were absent in all waste water samples, traces of scandium, gallium, niobium, bismuth, and lanthanum were found. Lead, barium, molybdenum, tin, copper, silver, zinc, nickel, zirconium, cobalt, strontium and chromium were ubiquitous. The rate of elimination in biological treatment plants was 30-75%; 80-100% for cobalt, 62-78% for tin and barium, and 40-50% for nickel and zirconium. Copper and silver passed the treatment plant in more or less unchanged concentrations. The efficiency of aeration basins and biological filters in terms of heavy metal elimination was about the same. Additional reduction of the concentration can be reached by final treatment in lagoons (by 10-25% for copper, silver and zirconium, and by 60% for chromium). (Takacs-FIRL)
W76-09002

MEASUREMENT OF THE OXYGENATION CAPACITY IN WASTE WATER TREATMENT PLANTS USING COMPLETELY MIXED ACTIVATED SLUDGE (MESURE DE LA CAPACITE D'OXYGENATION DANS LES STATIONS DE TRAITEMENT A BOUES ACTIVEES EN MELANGE INTEGRAL),
For primary bibliographic entry see Field 5D.
W76-09006

MULTI-REACTION PROTON ACTIVATION ANALYSIS FOR TRACES OF MOLYBDENUM,
Max-Planck-Institut fuer Metallforchung, Stuttgart (West Germany). Institut fuer Werkstoffwissenschaften.
V. Krivan.
Analytica Chimica Acta, Vol. 79, p. 161-173, November 1975, 2 fig, 5 tab, 19 ref.

Descriptors: *Heavy metals, *Molybdenum, Analytical techniques, *Cobalt, *Pollutant identification, Trace element.
Identifiers: *Proton analysis(Multi-reaction).

Molybdenum can be determined with high sensitivity by proton activation analysis via five proton-induced principal reactions. Thick molybdenum targets were bombarded with 12-MeV and 15-MeV protons and the different principal reactions studied. This multi-reaction activation technique allows for the checking of accuracy of the analysis with regard to nuclear and instrumental interferences as well as with regard to the depth distribution of molybdenum in the sample. Analytical application of this multi-reaction proton activation analysis is illustrated by the instrumental determination of molybdenum in cobalt. (Hoyle-Vanderbilt)
W76-09036

THE EFFECT OF LEAD ON MOUSE BRAIN DEVELOPMENT,
Mount Sinai School of Medicine, New York.
For primary bibliographic entry see Field 5C.
W76-09038

SOME COMMENTS ON INTERFERENCES BY CU(II) IONS AND AG(I) IONS ON THE WET REDUCTION-FLAMELESS ATOMIC ABSORPTION DETERMINATION OF MERCURY,
Geological Survey of Canada, Ottawa (Ontario).
L. R. Jonasson.
Journal of Geochemical Exploration, Vol. 3, No. 1, p. 77-81, March 1974, 1 fig, 4 ref.

Descriptors: *Heavy metals, Geochemistry, Analytical techniques, *Copper, *Mercury, Soil analysis, Pollutant identification.
Identifiers: *Ion interferences, *Flameless atomic absorption, *Silver.

It has been determined that previously reported interference by Cu(II) and Ag(I) ions in the determination of mercury by a wet-reduction-flameless atomic absorption is caused by the presence of chloride ions. If chloride ion is excluded from the system or at least kept very low, there is no interference from Cu(II) or Ag(I). The Jonasson et al. method involves leaching the samples in 100 ml of a solution 4 M in HN03 and 0.143 M in (1973) HC1, then generation of elemental mercury upon addition of 15 ml 5% w/v tin(II) sulphate dissolved in M H2S04. Thus, the final chloride concentration of the system is 0.124 M or 4400 ppm. Coprecipitated AgC1 in the leachate is redissolved after an hour hot leaching. The mechanism for interference by Cu(II) in the presence of chloride ion, and effects of Ag(I), Pb(II) and Zn(II) are discussed. (Hoyle-Vanderbilt)
W76-09039

TITRATION OF ANTIMONY (III) WITH CERIUM (IV) SULPHATE AND DIPHENYLAMINE AND ITS DERIVATIVES AS REVERSIBLE INDICATORS,
Andhra Univ., Waltair (India). Dept. of Chemistry.
G. Rao, S. G. Viswanath, and M. Gandikota.
Analytica Chimica Acta, Vol. 79, p. 273-278, October, 1975, 4 tab, 17 ref.

Descriptors: *Indicators, Analytical techniques, *Iron, Arsenic compounds, *Pollutant identification, Volumetric analysis.
Identifiers: Diphenylamine, Antimony, Cerium sulphate, Arsenic.

Diphenylamine, barium diphenylamine sulphonate, N-phenylanthranitic acid and 2-nitrodiphenylamine had been investigated as reversible indicators for the titration of antimony (III) with cerium (IV) sulphate in 0.5-2 M sulphuric acid medium. Diphenylamine is the most satisfactory in titrations of antimony (III) in chloride-free solutions as low chloride concentrations affect the indicator action of the others. Iodine catalyst is necessary to accelerate the reduction of the oxidized indicator by antimony (III). Titrations of antimony (III) in mixtures with iron (II) and arsenic (III) are also considered. (Hoyle-Vanderbilt)
W76-09040

CONTENTS OF ELEVEN TRACE ELEMENTS IN UREILITE ACHONDRITES,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
C. M. Binz, M. Ikramuddin, and M. E. Lipschutz.
Geochimica et Cosmochimica Acta, Vol. 39, p. 1576-1579, 1975, 1 fig, 1 tab, 23 ref.

Descriptors: *Trace elements, *Heavy metals, Analytical techniques, *Geochemistry, *Minerology, *Pollutant identification.
Identifiers: *Ureilite achondrites.

Eleven trace elements: As, Bi, Cd, Co, Cs, Ga, In, Se, Te, Tl and Zn, were determined in the six known ureilite achondrites by neutron activation analysis. All 11 elements are depleted below Cl levels and their characteristic abundance pattern differs substantially from those of chondritic groups. Thus ureilites do not represent a simple mixture of volatile-rich chondrites with achondritic material but perhaps cosmochemically-fractionated achondritic material and a late distillate of mobile elements. (Hoyle-Vanderbilt)
W76-09041

SIMULTANEOUS SPECTROPHOTOMETRIC DETERMINATION OF NICKEL AND COBALT IN MIXTURES WITH 3-HYDROXYPICOLINEALDEHYDE AZINE,
Seville Univ., (Spain), Dept. of Analytical Chemistry.
A. G. DeTorres, M. Valcarcel, and F. Pino.
Analytica Chimica Acta, Vol. 79, p. 257-263, October 1975, 3 fig, 3 tab, 2 ref.

Descriptors: *Heavy metals, *Nickel, *Cobalt, *Analytical techniques, *Spectrophotometry, *Pollutant identification, Chemical properties.
Identifiers: 3-hydroxypicolinealdehyde azine.

The properties of the nickel complex of 3-hydroxypicolinealdehyde azine are described. The optimal conditions for a selective and sensitive spectrophotometric determination of nickel and mixtures of nickel and cobalt in ratios from 0.1 to 10 cm are discussed. The absorption spectra of the nickel and cobalt complexes are sufficiently different to allow the simultaneous spectrophotometric determination of both ions when the absorbances are measured at 480 nm and 540 nm. (Hoyle-Vanderbilt)
W76-09042

CHEMICAL INTERFERENCE EFFECTS IN THE ATOMIC ABSORPTION SPECTROMETRIC DETERMINATION OF LEAD WITH PREMIXED INERT GAS (ENTRAINED AIR)-HYDROGEN FLAMES.
Osaka Prefecture Univ., (Japan). Dept. of Applied Chemistry.
T. Nakahara, and S. Musha.
Applied Spectroscopy, Vol. 29, No. 4, p. 352-354, July/August, 1975, 1 fig, 2 tab, 12 ref.

Descriptors: *Heavy metals, *Lead, Analytical techniques, *Pollutant identification.
Identifiers: *Chemical interference, *Magnesium chloride, *Lead atomic absorption, Inert gas(Entrained air)-hydrogen flames.

An investigation is described of chemical interference effects and their elimination in the atomic absorption spectrometric determination of lead with the argon (entrained air)- and nitrogen (entrained air)-hydrogen flames. Depressing interferences were observed over wide ranges of concentration of many diverse elements, but a large amount of magnesium in the form of magnesium chloride eliminated these interferences. The effects of various other elements on lead atomic absorption in the inert gas (entrained air)-hydrogen flames were studied in detail at constant concentration levels. Other possible additives to eliminate interferences were also studied. The method was successfully applied to the determination of lead in several alloys. (Hoyle-Vanderbilt)
W76-09043

HYDROGEOLOGICAL CONDITIONS OF AL-HAMAD AREA, IRAQ,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2F.
W76-09068

CHEMILUMINESCENT METHOD OF DETERMINING MANGANESE IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2K.
W76-09077

EXPEDIENT TECHNIQUE OF PERMANENT OBSERVATIONS -- AN INDISPENSABLE TOOL ON STUDYING THE LIMNOLOGY OF RIVERS,
For primary bibliographic entry see Field 7B.
W76-09106

FISHES IN OXYGEN-MINIMUM ZONES: BLOOD OXYGENATION CHARACTERISTICS,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-09112

EFFECTS OF COPPER ON THE CORAL REEF ECHINOID ECHINOMETRA MATHAEI,
Guam Univ., Agana. Marine Lab.
For primary bibliographic entry see Field 5C.
W76-09113

TOXICITY OF MINE DRAINAGE TO EMBRYONIC AND LARVAL BOREAL TOADS (BUFONIDAE: BUFO BOREAS),
Denver Univ., Colo. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-09115

FIELD EVALUATION OF BENZOPYRENE HYDROXYLASE INDUCTION AS A MONITOR FOR MARINE PETROLEUM POLLUTION,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
J. F. Payne.
Science, Vol. 191 No. 4230, p 945-946, 1976. 1 fig, 6 ref.

Descriptors: *Marine fish, *Enzymes, Biochemistry, *Oil pollution, *Oil wastes, Water pollution, Pathology, *Monitoring, Analytical techniques, *Pollutant identification, Bioindicators, Canada.
Identifiers: *Benzopyrene hydroxylase, *Cunner, Tautogolabrus adspersus, Sublethal responses, Newfoundland.

Fish from petroleum-contaminated sites in the marine environment have elevated levels of benzopyrene hydroxylase activity in liver and gill tissue. This sublethal response appears to be a practical biological monitor for marine petroleum pollution. (Katz)
W76-09116

AXENIC CULTURES OF TETRAHYMENA PYRIFORMIS AS TOXICOLOGICAL TOOLS,
V. Moravcova.
Acta Hydrochimica et Hydrobiologica, Vol. 1, No. 4, 2 fig., 3 tab., 33 ref.p. 83-94, 1976.

Descriptors: *Pollutant identification, *Protozoa, Microorganisms, Water quality control, *Bioindicators, Analytical techniques, *Bioassay, Methodology, Laboratory tests, *Toxicity, Cultures, Invertebrates, Growth rate, Nutrient requirements, Testing, Lethal limit, Herbicides, Pesticides, Insecticides, Phenols.
Identifiers: *Tetrahymena pyriformis, Agrion, Arborol, o-Cresol, Novozir.

The method of determining toxicity in streams by the use of axenic cultures of the protozoan species Tetrahymena pyriformis is described. Very simple media can be used for the cultivation of test organisms and duration of the whole direct toxicity test is limited to 24 hours. Other advantages included very rapid growth in freshly inoculated media so that cultures are ready for tests in three days and good growth in media with minimal nutrient content. Long-term tests can also be followed for 2-4 weeks. The disadvantage falls in the need for laborious microscopical counts at short intervals. (Katz)
W76-09121

MEASUREMENT OF METAL TOXICITY BY BIOCHEMICAL OXYGEN DEMAND,
Rockland County Sewage Treatment Plant, Orangeburg, N. Y.
A. Mowat.
Journal of the Water Pollution Control Federation, Vol. 48, p. 853-865, 1976. 16 fig., 14 tab., 8 ref.

Descriptors: *Biochemical oxygen demand, *Toxicity, Mercury, *Metals, *Bioassay, Chromium, Iron, Copper, Cadmium, Nickel, *Heavy metals, Cobalt, Zinc, Laboratory tests, Water analysis, Analytical techniques, Microorganisms, Measurement, *Pollutant identification.
Identifiers: Silver, Tin, Cyanide, Cr(III), Cr(IV).

The toxicities of 12 common metals and cyanide were assayed by the biochemical oxygen demand method over a period of 1.5 yr using a 5 percent raw wastewater inoculum. Tin and zinc were assayed from 40 mg/l in 5 days were in the following order: Hg, Ag, Cr(III), Al, Fe, Cu, CN, Ni, Cd, Co, Cr(VI), Sn, Zn. All metals showed decreases in toxicity after 2 wk incubation. A series of 5-day biochemical oxygen demands at low metals concentration gave toxicities as follows: Ag, Hg, Cu, CN, Cd, Co, Ni, Cr(III), Cr(VI), Al. (Katz)
W76-09127

CIRCULATORY ADAPTATIONS TO THE OXYGEN MINIMUM LAYER IN THE BATHYPELAGIC MYSID GNATHOPHAUSIA INGENS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-09128

EFFECT OF SAMPLE PREPARATION ON BLOOD LEAD VALUES,
National Research Inst. for Occupational Diseases, Johannesburg (South Africa).
P. Baily, and T. A. Kilroe-Smith.
Analytica Chimica Acta, Vol. 77, p. 29-36, July, 1975. 2 fig, 2 tab, 16 ref.

Descriptors: *Heavy metal, *Pollutant identification, *Lead, *Analytical techniques, *Spectrophotometry, Chemical precipitation, Toxins, Human diseases, Toxicity, Separation techniques, Digestion, Drying.
Identifiers: *Atomic absorption, *Blood lead values, *Sample preparation, Carbon rod atomizer, Trichloroacetic acid, Massmann cuvette, Graphite tubes, Ashing, Atomization.

The determination of lead in blood by graphite-furnace atomic absorption spectrometry is markedly affected by the method of preparing the blood. Seven different methods of preparation were investigated. These included dilution of 0.5 ml blood with 4.5 ml double-distilled water, 0.01 M hydrochloric acid, or 2% Triton-X, and addition of 1.0 ml Unisol to 0.5 ml blood with subsequent addition of 3.5 ml double-distilled water or 3.5 ml 0.01 M hydrochloric acid. These methods had large confidence intervals and very high background absorbances. The last two methods, a slightly modified acid extraction method of Einarsson and Lindstedt, and the digestion method of Mahin and Lofberg, had low background levels and small confidence intervals. Because of the convenience of the Einarsson-Lindstedt method, which was faster than the Mahin and Lofberg method, required no heat for digestion, and which could be carried out in a single tube, this was the method adopted. (Davis-Vanderbilt)
W76-09130

GROUND-WATER DATA FOR SUNFLOWER COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09140

GROUND-WATER DATA FOR CARROLL COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 7C.
W76-09141

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN CHAMBERS, LIBERTY, AND MONTGOMERY COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W76-09144

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 7C.
W76-09145

RESULTS OF PHYTOPLANKTON SAMPLING AT NATIONAL STREAM QUALITY ACCOUNTING NETWORK STATIONS IN MONTANA--1975 WATER YEAR,
Geological Survey, Helena, Mont.
J. R. Knapton, and B. M. Bochy.
Open-file report 76-219, March 1976. 27 p, 2 fig, 13 tab, 4 ref, append.

Descriptors: *Phytoplankton, *Streams, *Water quality, *Montana, *Eutrophication, Baseline studies, Networks, Primary productivity, Systematics, Algae, Dissolved oxygen, Photosynthetic oxygen, Nutrients, Water pollution effects.
Identifiers: *Cell counts, Nutrient loading, Filamentous, Organic pollution.

Twelve National Stream Quality Accounting Network stations were operated in Montana during the 1975 water year (Oct. 1, 1974-Sept. 30, 1975). The network was established to acquire a base of hydrologic data for use by agencies engaged in water-resources planning on a national or regional scale. Among the characteristics analyzed were phytoplankton identification and cell counts. Samples consisted of composites of equal aliquots, collected at the center of each quartile of flow, using modified suspended-sediment samplers and sediment collection techniques. Identification and counting were done using the Sedgwick-Rafter cell method. Cell counts ranged from 21 cells per millilitre at Flathead River at Flathead, British Columbia to 27,000 cells per millilitre at Yellowstone River near Sidney. The class Bacillariophyceae was most abundant in both number and variety at all sampling sites. Anabaena and Aphanizomenon of the phyllum Cyanophyta were found at six stations and two stations respectively. These two genera of blue-green algae often become abundant in enriched waters resulting in nuisance conditions. (Woodard-USGS)
W76-09146

WATER RESOURCES OF WALTON COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W76-09149

NUTRIENT MASS BALANCE IN COLUMNS REPRESENTING FILL SYSTEMS FOR DISPOSAL OF SEPTIC TANK EFFLUENTS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5E.
W76-09164

INSTRUMENTATION FOR ANALYZING TOD (INSTRUMENTELLE TSB-ANALYTIK),
R. Schulze-Rettmer.
Zeitschrift fuer Wasser-und Abwasser Forschung, Vol. 9, No. 1, p 11-17, 1976. 7 fig. 24 ref.

Descriptors: *Oxygen demand, Equipment, *Analytical techniques, Automation, Laboratory equipment, *Pollutant identification, *Instrumentation.
Identifiers: *Total oxygen demand.

Automatic equipment manufactured by seven different firms for total oxygen demand (TOD) analysis is described. Four of these use dichromate-sulfuric acid at temperatures between 130 C and 180 C. Due to the constant flow and constant temperature of reaction, accuracy of automatic equipment is superior to that of the manual method of dichromate oxygen demand by the reflux method. The other three types of analyzers operate at a higher temperature (900 C) using oxygen and a platinum catalyst. Performance of the analysis is simple and rapid. Ammonia and chlorides are oxidized; nitrate, sulfate and phosphate are partially reduced. The high temperature TOD-measurement procedure is most useful for determining the oxygen demand in certain industrial effluents and process steams. The method has not been established for use in the monitoring of sewage treatment plant effluents or river water. (Kramer-FIRL)
W76-09185

REPRESENTATIVE ANALYTICAL WASTE WATER SAMPLES. NOTE I--A NEW SAMPLER (SIGNIFICATIVA DI CAMPIONI ANALITICI DI ACQUE REFLUE. NOTA I -- NUOVO DISPOSITIVO DI CAMPIONAMENTO),
C. Versino.
Inquinamento, Vol. 17, No. 12, p 17-30, December, 1975.

Descriptors: Monitoring, *Sampling, Analtyical techniques, Equipment, Water analysis, *Water sampling, *Pollutant identification.

New equipment for taking multiple waste water samples works by determining the level of the liquid in the duct, and positioning the frame on the telescopic rod in such a way that, when the system operates, the pumps are completely submerged. Once the aspiration apertures have been adjusted to the various samples, the equipment is placed in the duct. Following the arragement of the pipe terminals in each collection receptacle, the system begins to record the position and time of the sampling. The advantages of this system include the definition of a maximum size of the suspended particles in the sample, instantaneous and simultaneous sampling at various depths or at various angles with respect to the axis, and the possibility of differentiating and characterizing parts of the area and the depth of the system under examination. The actual characteristics of the samples are not altered during the process; as with communicating receptacles, there is no air in either the aspiration tubes or the pumps. (Waltner-FIRL)
W76-09186

ENERGY SAVING--AN IMPORTANT CONSIDERATION,
K. Scherb, and H. Bauer.
Water and Pollution Control, Vol. 114, No. 2, p 25, February, 1976. 1 fig.

Descriptors: Waste water treatment, *Pollutant identification, *Oxygen, *Measurement, Treatment facilities, Equipment, Activated sludge, Biological treatment, Dissolved oxygen analyzers, Energy.
Identifiers: Oxygen sensor.

The development of a new oxygen sensor for use in activated sludge plants is reported. Manufactured by Zullig, the sensor works according to the principle of Todt, based on the production of a polarized current between two different precious metals in an electrolyte solution, the value depending on the amount of dissolved oxygen. The water sludge mixture to be tested is continuously brought to two concentric metal rings (electrodes)

by the vertical movement of a cup surrounding the electrodes. The influence of temperature on the produced current is eliminated by a thermistor which compensates for the temperature effect at the moment of measurement. Compared to other oxygen measurement systems, this sensor is low in maintainance, due to the continuous cleaning of the electrodes. Only exterior cleaning and testing is necessary after one or two months of operation. The electrodes are continuously cleaned by means of a rotating grinding stone, which must be replaced about every three to four months. The continuous measurement of dissolved oxygen permits the control required to ensure optimum bacterial sewage breakdown, resulting in a savings in energy. (Kramer-FIRL)
W76-09187

THE NATURE OF ACTIVATED SLUDGE FLOCS,
University Coll., Cardiff (Wales). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-09188

COMPARISON OF WARBURG AND MARAIS METHODS OF DETERMINING OXYGEN UPTAKE RATE CONSTANTS,
North Dakota Univ., Fargo. Dept. of Civil Engineering.
Y. T. Hung, and W. W. Eckenfeld, Jr.
Water and Pollution Control, Vol. 114, No. 2, p 6-7, 9, 25, February, 1976. 3 fig, 3 tab, 12 ref.

Descriptors: *Dissolved oxygen, *Biochemical oxygen demand, Measurement, Rates, Biodegradation, Rivers, Texas, *Pollutant identification, Waste assimilative capacity.
Identifiers: *Warburg method, *Marais method, *Oxygen uptake constant.

A major parameter required for the dissolved oxygen model is the oxygen uptake rate constant (k) at which waste waters are biodegraded as they enter a river. The Warburg respirometric technique has been used to determine BOD and k values in waste waters. A second method, that proposed by Marais, combines the use of a galvanic cell oxygen analyzer and a reaeration technique to determine these values. Studies were made to apply the Marais technique to the determination of oxygen uptake rate constant values of the Houston, Texas, Ship Channel waters. Results were compared with those obtained by the Warburg method. The constant for these waters was found to vary from 0.027 to 0.14 per day with an average value of 0.092 per day by the Marais method. Correlations between the results of k values and ultimate BOD values obtained by the Warburg method were poor. It was concluded that the Marais method is better applied to the determination of k values in such waters as the Houston Ship Channel than the Warburg method, particularly because these waters had low oxygen uptake rate values. (Kramer-FIRL)
W76-09189

IMPROVED METHOD FOR THE PHOSPHATE DETERMINATION IN WASTE WATER (VERBESSERTE METHODE ZUR PHOSPHATBESTIMMUNG IM ABWASSER),
U. Bretscher.
Gas- und Wasserfach-Wasser/Abwasser, Vol. 117, No. 1, p 31-32, 1976. 1 fig, 7 ref.

Descriptors: *Phosphates, *Pollutant identification, Waste water treatment, *Analytical techniques, Nutrients.
Identifiers: *Ohle's method.

An improved variety of Ohle's method for the determination of phosphate in waste water is described. To prevent the oxidation of stannous chloride present in the reducing solution on exposure to air, a reducing solution was prepared by dissolving stannous chloride in anhydrous glycerin at 40-50 C. The reducing solution thus obtained is stable for six months, while that according to Ohle's method had to be prepared freshly daily. For reasons yet unclear, the method using the improved reducing solution is slightly more sensitive than the original method. (Takacs-FIRL)
W76-09190

THE PHENOL-SULFURIC ACID TEST,
Mississippi State Univ., State College.
Water and Sewage Works, Vol. 123, No. 2, p 55, February, 1976. 1 fig, 9 ref.

Descriptors: *Phenols, *Analytical techniques, *Sludge, *Carbohydrates, Anthrone test, Measurement, Biological treatment, Waste water treatment, *Pollutant identification.
Identifiers: Sludge analysis, *Phenol-sulfuric acid test.

Total carbohydrate content is often measured in biological sludges in order to understand the complex biochemical processes that occur within abiological treatment system. The phenol-sulfuric acid test constitutes an effective alternate method of carbohydrate analysis to the standard anthrone test. The phenol-sulfuric acid method is generally less expensive, less complicated and easier to employ, and will frequently give more realistic results. The new method measures sugars, such as heptoses, pentoses, uronic acids, and the sugar components of nucleic acids, while the anthrone reagent is relatively insensitive to all these substances. The phenol method has also been used for the analysis of carbohydrate in freeze-dried activated sludges, with excellent results. The reagents required for the test and the analytical procedure were detailed. It has been demonstrated that if the analytical result desired is total carbohydrate rather than a specific carbohydrate, the method of choice should be the phenol-sulfuric acid test. (Kramer-FIRL)
W76-09191

METHODS AND INSTRUMENTS FOR MONITORING SURFACE WATER AND WASTE WATER QUALITY (VERFAHREN UND GERAETE ZUR UEBERWACHUNG DER OBERFLAECHEN- UND ABWASSERQUALITAET).
Draht-Fachzeitschrift, Vol. 26, No. 1, p 17-19, 1976. 3 fig, 1 ref.

Descriptors: *Monitoring, *Instrumentation, Surface waters, Chemical properties, Physical properties, Measurement, Oxygen, Dissolved oxygen, Turbidity, Analytical techniques, *Pollutant identification.

Methods and instruments for monitoring certain physical and chemical parameters of surface waters and waste waters are described. The continuous monitoring of suspended solid matter content is possible by a turbidimetric method based upon the light scattering principle, where the proportion of transmitted light is maintained at a constant value, and the scattered light is a measure of turbidity. The oxygen content is measured by means of a water-impermeable but oxygen-permeable plastic membrane, where the oxygen passing through the membrane generates electric current in an electrochemical cell. The electric conductivity is determined by an inductive method with the water circulated through two ring-core transformers in a closed loop. An autonomous, automatic water quality monitoring station incorporating instruments for the measurement of turbidity, dissolved oxygen, pH value, and conductivity is suitable for continuous operation for three months. (Takacs-FIRL)
W76-09192

A NEW STRATIFIED PLANKTON SAMPLER FOR SHALLOW WATERS, (IN SPANISH),
La Plata Univ. (Argentina). Instituto del Museo.
For primary bibliographic entry see Field 7B.
W76-09193

WATER POLLUTION MONITORING USING MATCHED SPATIAL FILTERS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Physics.
S. P. Almeida, and J. K-T. Eu.
Applied Optics, Vol. 15, No. 2, p 510-515, February, 1976. 4 fig, 15 ref.

Descriptors: *Monitoring, *Water pollution control, *Filters, Optical properties, *Diatoms, Algae, Automation, Instrumentation, Equipment, *Pollutant identification.

A prototype optical processing system has been developed for identifying biological specimens called diatoms using matched spatial filtering techniques. This semi-automated system would be an important alternative to the tedious counting and classification operation which is presently conducted under a microscope by a highly trained person. Results were obtained from a parallel processor and demonstrated that matched filtering techniques are capable of identifying the diatoms. The degree of discrimination is dependent on the spatial frequency of the filter, its diatom orientation, the diatom's size variation, and whether the filter was averaged. Construction of the filters, including averaged filters to take into account variations in depth of focus and size, was detailed. Some sample inputs and the signals detected were illustrated. Autocorrelation between signals to identify similar diatoms was also described. (Kramer-FIRL)
W76-09194

IDENTIFICATION OF NITROGEN AS A GROWTH-LIMITING NUTRIENT IN WASTEWATERS AND COASTAL MARINE WATERS THROUGH CONTINUOUS CULTURE ALGAL ASSAYS,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman.
Water Research, Vol. 10, No. 2, p 97-104, 1976. 7 fig, 2 tab, 54 ref.

Descriptors: *Pollutant identification, *Nitrogen, *Biomass, Algae, Eutrophication, *Bioassay, Water pollution, Water pollution effects, Marine algae, Massachusetts, Rhode Island, Coasts, Sea water, Phosphorus, Nutrients.
Identifiers: *Algal assays, Continuous culture algal assays, Growth-limiting nutrients, Particulate phosphorus, Particulate nitrogen.

Nitrogen can often be a growth limiting nutrient in both waste waters and in coastal waters in which the major contribution of nutrients originates from domestic waste discharges. The results of continuous culture algal assays on waste water-sea water mixtures supporting this view are reported. Analytical expressions are presented that give the limiting nutrient present in a given water. Two series of assays were conducted on waste waters from the coasts of Massachusetts and Rhode Island. In the first series waste waters representing different degrees of treatment were added to sea water in volume ratios of 1:3 and 1:1 waste water:sea water. In the second series, ratios were reduced to 1:12 and 1:6.5. Waste water was collected at the treatment facilities and mixed with sea water in the desired ratios in the laboratory. All indigenous algae were removed and the particular test algae were added. Particulate nitrogen, ash-free dry weight, and particulate phosphorus were measured to determine algal biomass. The results show that nitrogen is the growth-limiting nutrient in the waste waters studied and in the marine waters receiving these wastes. There was a linear relationship between total inorganic nitrogen in the influent and particulate nitrogen representing algal biomass up to a total inorganic nitrogen concentration of 10 mg/liter. The nitrogen-phosphorus ratios in the test algae varied

between 10 and 20 and in the sea water they varied between 4 and 12. Phosphorus had little effect on algal growth. The elimination of phosphate free detergents will have little effect on the degree of eutrification in coastal waters. (Pinto-FIRL)
W76-09195

CHLORINATION AND IODINATION OF POLIOVIRUS AND F2,
Maryland Dept. of Natural Resources, Annapolis.
W. N. Cramer, K. Kawata, and C. W. Kruse.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 61-76, January, 1976. 6 fig, 5 tab, 43 ref.

Descriptors: *Waste water treatment, *Bacteria, *Viruses, *Pollutant identification, Model studies, Bioassay, *Chlorination, Iodine.
Identifiers: *Poliovirus III, f2, *Iodination.

There is a need for in-plant studies of virus removal during waste water treatment. The best assessment of virus survival patterns may be obtained by seeding the treatment plant to a high titer with one virus, as has been done with poliovirus III. This type of animal virus, however, is expensive and takes an impractically long amount of time to obtain. Thus, the bacterial virus f2 has been suggested as a substitute for the poliovirus because it so closely resembles members of that enterovirus group. To be an acceptible substitute, f2 must not multiply or die away in waste water and must exhibit a susceptibility to halogenation that is reasonably similar to the more resistant members of the enteric virus group. Both f2 and poliovirus III were seeded together in autoclaved waste water and exposed simultaneously to chlorine and iodine. Results indicated that f2 bacterial virus is an acceptable mode for the enteric virus group. It can be grown in large quantities, and assayed with relative ease. (Kramer-FIRL)
W76-09196

NITROGEN AND PHOSPHORUS LEVELS IN SOILS BENEATH SEWAGE DISPOSAL PONDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
L. J. Lund, A. L. Page, and C. O. Nelson.
Journal of Environmental Quality, Vol. 5, No. 1, p 26-30, January/March, 1976. 4 fig, 2 tab, 12 ref.

Descriptors: *Analytical techniques, *Soil analysis, *Phosphorus, *Nitrogen, *Path of pollutants, Nutrients, Groundwater, *Sewage disposal.

Soil cores were collected at two treatment plants beneath sewage sludge and effluent ponds and an evaluation was made of the movement of phosphorus and nitrogen in the soil. Both soil profiles were coarse-textured and open. Total nitrogen in the soils was enriched to 4 m and 8 m, the maximum sampling depths. Considerable excesses of ammonium-nitrogen concentrations compared to controls, as deep as 4.0 m, demonstrated movement of substantial quantities of ammonium in the soil below the ponds. Concentrations of nitrate-nitrogen in soil solutions under disposal sites were considerably higher than those from control sites in situations where sampling encountered the water table, demonstrating that nitrate-nitrogen had reached the water table. Phosphorus enrichment was evident as deep as 3 m beneath the ponds. Ponding sewage waste water on porous open soils and subsequent percolation through soil may contaminate underground water supplies with phosphorus, nitrate-nitrogen, and ammonium-nitrogen. Water table depth, downward soil solution flow rates relative to lateral groundwater flow rates, and resultant mixing influence the extent of the effect. (Snyder-FIRL)
W76-09197

RECOMMENDATION FOR THE EVALUATION OF THE BIOLOGICAL DEGRADABILITY OF EFFLUENTS OF VARYING ORIGIN (VORSCHLAG ZUR BEURTEILUNG DER BIOLOGISCHEN ABBAUBARKEIT VON ABWAESSERN UNTERSCHIEDLICHER HERKUNFT),
G. Straten, and H. Witte.
Zeitschrift fuer Wasser- und Abwasser-Forschung, Vol. 9, No. 2, p 38-41, 1976. 3 fig, 30 ref.

Descriptors: *Biochemical oxygen demand, *Pollutant identification, *Measurement, Waste water treatment, Standards, Water quality, *Biodegradation, Industrial wastes, Municipal wastes.
Identifiers: Municipal/industrial wastes.

Biochemical oxygen demand (BOD) measurements are inaccurate, particularly in the evaluation of the biodegradability of industrial effluents. A method of BOD measurement and evaluation is proposed, to help minimize disadvantages in the sharing of costs of building and maintaining waste water treatment facilities. Effluents are mixed with varying amounts of a standardized food-solution, to guarantee a constant minimum food level in the testflask of the BOD test. The standard liquor has a composition similar to that of domestic sewage. It can then be seen whether the waste water composition in question has any toxic effect on the standard solution. It would be possible to compare the results with different types of effluents in an objective and reproducible manner and to determine what would be the most probable BOD values, when industrial effluent is mixed with domestic sewage. (Kramer-FIRL)
W76-09198

PHOTOGRAPHIC ANALYSIS OF WATER QUALITY CHANGES,
Georgia Univ., Athens.
C. P. Lo.
Photogrammetric Engineering and Remote Sensing, Vol. 42, No. 3, p 309-315, March, 1976. 7 fig, 5 ref.

Descriptors: *Photography, *Water analysis, Water quality, *Aerial photography, *Pollutant identification, Water pollution sources, Asia, *Path of pollutants, Remote sensing.
Identifiers: *Hong Kong, Color photography.

The effect of coastal reclamation and accompanying changes in land use on water quality in Hong Kong's Rambler Channel was studied. Black-and-white aerial photographs from 1956 were compared with true color aerial transparencies from 1975. Artificial pollution became evident, especially in the inlets and bays where land is reclaimed and factories set up. The most seriously polluted sites usually are in confined locations. Immediate measures for clearing up these sites are recommended. True-color aerial photography in the form of transparencies was found to be useful in identifying pollution sources and types of pollutants. (Snyder-FIRL)
W76-09199

FACTORS AFFECTING THE EXTRACTION AND ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS IN WATER,
Imperial Coll. of Science and Technology, London (England). Dept. of Public Health Engineering.
M. A. Acheson, R. M. Harrison, R. Perry, and R. A. Wellings.
Water Research, Vol. 10, No. 3, p 207-212, 1976. 3 fig, 5 tab, 18 ref.

Descriptors: *Analytical techniques, *Pollutant identification, Aromatic compounds, *Chromatography, Extraction, Organic compounds.
Identifiers: Polycyclic aromatic hydrocarbons, Thin layer chromatography, Gas-liquid chromatography.

Factors such as the initial concentration of polycyclic aromatic hydrocarbons (PAH), the presence of suspended solids, and prolonged storage of samples prior to analysis, which are expected to affect the efficiency of extraction of polynuclear aromatic hydrocarbons from environmental water samples, were systematically investigated. PAH were added to purified water and to purified water with Fullers Earth added, and then extracted by Ultra-Turrax. Some samples of both solutions were mixed for 6 hr instead of the usual several min, and continuous solvent extraction was compared to Ultra-Turrax for samples containing Fullers Earth. Two extract purification procedures were compared, as were thin layer chromatography (TLC) and gas-liquid chromatography (GLC) for analysis. Both TLC and GLC were used to analyze environmental water samples. Extraction efficiencies were between 30% and 85%. Although precise prediction of efficiency for a given sample is impossible, probable extraction efficiency can be predicted and makes more accurate measurements of PAH possible. An existing purification procedure had serious drawbacks, which were overcome by use of dimethylsulfoxide. TLC has poor sensitivity for several compounds, but has high accuracy for the compounds determined and avoids extract purification and associated losses. GLC has a more uniform sensitivity, but is unable to separate some isometic compounds, and is more susceptible to interference by background organic materials, and apparently less accurate than TLC. Use of various analytical techniques on river water and road runoff tended to reaffirm the results of the previous laboratory investigations. (Snyder-FIRL)
W76-09200

DETERMINATION OF AMMONIA AND KJELDAHL NITROGEN BY INDOPHENOL METHOD,
Technion-Israel Inst. of Tech. Haifa, Israel. Environmental Engineering Lab.
D. Scheiner.
Water Research, Vol. 10, No. 1, p 31-36, 1976. 6 fig, 4 tab, 20 ref.

Descriptors: *Ammonia, *Nitrogen, *Pollutant identification, *Waste water(Pollution), Analytical techniques, Measurement.
Identifiers: Kjeldahl nitrogen.

The Berthelot reaction was studied and modified for determining ammonia and Kjeldahl nitrogen in fresh water and waste water. It is based on development of a deep blue color when ammonia reacts with phenol and alkaline hypochlorite. A stable calibration curve was obtained using samples of known concentration. The modified analytical procedure is convenient and reliable. The phenol, the nitroprusside, and the buffer solution to minimize the effect of the pH of the sample are combined into a single reagent suitable for examining domestic waste water with a pH between 3 and 11.5 without correction. A separate measurement is not needed for the hypochlorite reagent. Results are highly reproducible between 0.02 and one mg/liter ammonia nitrogen. Forty-five minutes are required for the color to develop at room temperature, and it remains stable for 48 hr. Hardness above 400 mg/liter and above 5 mg/liter N nitrite ions can cause interference in domestic waste water. The dilution required by the measurements eliminates this interference in waste water samples that are high in ammonia. (Snyder-FIRL)
W76-09201

MONITORING DISSOLVED-OXYGEN CONTENT TO ASSURE CLEAN WASTEWATER,
J. R. Reeves.
Power, Vol 120, No. 4, p 68-69, April, 1976.

Descriptors: *Dissolved oxygen, Measurement, *Monitoring, *Activated sludge, Aeration, Waste water treatment, *Pollutant identification, Analytical techniques.
Identifiers: *Dissolved oxygen analyzers.

Numerous methods have been developed for measuring dissolved oxygen. These methods derive their importance from the fact that the dissolved-oxygen level must be held within a certain range in the activated sludge process. This process uses aerobic bacteria to break down water pollutants. The laboratory procedures for measuring dissolved oxygen include the Winkler method, which involves a chemical test of a water sample. There are also four alternative electrochemical methods: conductimetric, coulometric, potentiometric, and amperometric. In membrane-electrode techniques, a semipermeable membrane separates the electrolyte and the electrodes from the water. It is preferred that aeration basins contain 0.5 to 2.0 ppm oxygen. They should be measured between 2 and 3 ft beneath the surface near the effluent of the pond. To determine the oxygen concentration of a sample from its partial pressure, its temperature must be known, and most dissolved-oxygen analyzers include a temperature-sensing element. (Snyder-FIRL)
W76-09202

AN IMPROVED DETERMINATION OF CHEMICAL OXYGEN DEMAND IN WATER AND WASTES BY A SIMPLIFIED ACID DICHROMATE DIGESTION,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
E. Canelli, D. G. Mitchell, and R. W. Pause.
Water Research, Vol 10, No. 4, p 351-355, 1976. 3 fig, 1 tab, 22 ref.

Descriptors: *Chemical oxygen demand, *Analytical techniques, *Waste water(Pollution), *Water analysis, Laboratory tests, *Pollutant identification.
Identifiers: *Acid dichromate digestion.

An improved method was developed for determining chemical oxygen demand (COD) in water and waste water samples containing up to 1500 mg chlorine/liter. Sulfuric acid, potassium dichromate, silver sulfate, mercury (II) sulfate, and sulfamic acid are used to digest samples for 2 hr in glass tubes. While being digested, the samples are heated at about 140 C without boiling or refluxing. A colorimetric determination of excess dichromate oxidant is then performed. About 12 samples can be analyzed per hr. It is not necessary to correct for chlorine interference when there is less than 500 mg chlorine/liter. Three mg/liter is the detection limit. At 112 mg COD/liter, the relative standard deviation is 4.3%. This procedure was compared with the standard dichromate reflux method by analyzing 35 samples of waste water. The two data sets did not differ significantly. (Snyder-FIRL)
W76-09203

DESIGN OF NATIONWIDE WATER-QUALITY-MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
R. J. Pickering, and J. F. Ficke.
American Water Works Association Journal, Vol. 68, No. 2, p 82-85, February, 1976. 2 fig, 1 tab.

Descriptors: *Monitoring, *Water quality control, *Measurement, *Data collections, *Networks, Surface waters, Groundwater, Rivers, Administration, Planning, *Design criteria, Water quality standards.

The usefulness of a water quality monitoring network depends upon the water quality characteristics to be measured, the sites at which these measurements are to be taken, the frequency of measurement for each characteristic and at each point and the statistical parameter chosen to report each characteristic. In designing the type of water data network, one must define the function of the network and the geographic scope. The differences between surface water quality monitoring and groundwater monitoring are related to accessibility of sampling and patterns of measurements. Data to provide a measure of the quality of the United States' major rivers has been gathered by the National Stream Quality Accounting Network (NASQAN), consisting of 325 hydrographic data collection sites. While networks are applicable to deriving general patterns, it is too costly to design an all-purpose water quality monitoring network which includes all the facets of physical, chemical, and biological water quality. Specific objectives of any monitoring program should be outlined so that a proper mix of sampling sites, characteristics to be measured, and frequency of measurement may be selected. Information gathered through such networks should be in the form most suited to the needs of environmental planners and administrators. (Kramer-FIRL)
W76-09209

ANALYTICAL CHEMISTRY IN WATER POLLUTION CONTROL,
Michigan Univ., Ann Arbor.
K. H. Mancy.
Pure and Applied Chemistry, Vol. 44, No. 3, p 555-568, 1975. 1 fig, 3 tab, 27 ref.

Descriptors: Model studies, *Water quality control, *Monitoring, *Measurement, Data collections, Data storage and retrieval, *Pollutant identification, *Networks, Analytical techniques, Design criteria.
Identifiers: *Poland.

Optimal design of systems for measuring water quality should follow a rational stepwise procedure. The procedure includes defining short and long-term objectives, selecting parameters, sites, and frequency for measurement, and selecting analysis methods and data processing requirement. Developing a preliminary model able to satisfy the measurement objectives is very important. Such models can identify quantities and types of missing information as well as surplus information. The program and model may both be modified by cost-effectiveness analysis. An example of a strong water pollution measurement program is that set up in Poland with assistance from the United Nations Development Program and the World Health Organization. (Snyder-FIRL)
W76-09221

STUDY ON THE BALANCE OF HEAVY METALS IN ACTIVATED SLUDGE TREATMENT PROCESS (GESUI SHORI SHISETSU NI OKERU JUKINZOKURUI NO SHUSHI NI KANSURU KENKYU),
Public Works Research Inst., Tokyo (Japan).
K. Saito, S. Ochi, K. Kobori, and I. Yagihashi.
Kankocho Kogai Senmon Shiryo, (Government Offices-Pollution Data), Vol. 11, No. 1, p 86-118, January, 1976. 32 fig, 35 tab, 27 ref.

Descriptors: *Heavy metals, *Sludge treatment, *Activated sludge, *Waste water treatment, Bacteria, Protozoa, *Pollutant identification.
Identifiers: Microbial populations.

A study was conducted between 1972 and 1974 to investigate the effects of low concentrations of heavy metals on a sewage treatment plant in terms of the overall treatment efficiency, and the growth and decomposition rates of activated sludge. The accumulation of heavy metals into the sludge and the loading balance of heavy metals in the treatment process were also determined. Laboratory scale activated sludge units of the continuous and plug flow types were operated. The heavy metals added to the sewage were Cd, Pb, Hg, Ni, Cu, Zn, and Cr in the forms of CdSO4, Pb(N03)2, HgC12, Ni(N03)2, Cu(N03)2, ZnS04, and K2Cr207. The critical concentration at which the inhibition occurred was one to ten Cd mg/liter, 10 mg Pb/liter and 0.005 to one mg Hg/liter. An increase in suspended solids in the effluent was symptomatic of the inhibition. Sludge production increased as the heavy metal concentration in the influent increased within the range of the experiment. Bacteria became dominant while the protozoa population decreased, indicating that one of the causes of increased sludge production is a change in the steps of the food chain due to the heavy metal addition. (Kramer-FIRL)
W76-09222

POSSIBLE INFLUENCE OF ATMOSPHERIC TRANSPORT ON THE TOTAL MERCURY CONTENT OF SOUTHEASTERN ATLANTIC CONTINENTAL SHELF SURFACE WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W76-09224

THE APPLICATION OF THE SCANNING ELECTRON MICROSCOPE TO FRESHWATER PHYTOPLANKTON TAXONOMY AND MORPHOLOGY,
Max-Planck-Institut fuer Limnologie zu Ploen (West Germany).
B. Hickel.
Archiv fur Hydrobiologie, Vol. 76, No. 2, p. 218-228, 1975. 15 fig., 31 ref.

Descriptors: *Analytical techniques, *Electron microscopy, *Algae, *Testing procedures, Phytoplankton, *Systematics, Cyanophyta, Chrysophyta, Euglenophyta, Chlorophyta, Europe, Diatoms, *Pollutant identification.
Identifiers: East Holstein Lakes(Germany), Cryptophyta, Dinophyta, Xanthophyta.

Scanning electron microscopy was used to study 250 different preparations of plankton from the East Holstein Lakes, Germany. Unfixed or fixed specimens were air-dried or dehydrated in a series of alcohol-ether solutions, then coated with gold over a thin layer of coal. Surfaces which were vacuum resistant and electrically conductive could then be photographed. Many planktonic algae are labile and require special treatment; washing is necessary to remove salt crystals. Care must be taken to avoid artifacts and distortion. Phytoplankton have different cell wall properties, so preparation must be adapted to each particular organism. The physiological condition of the plankton may also influence preservation of surface structures. Only Cyanophyceae and Cryptophyceae were not suitable for this method; however two similarly shaped Cryptophycean species were differentiated by their pellicular structure. Studies of Dinophycean cellulose walls, Chrysophycean cellulose or silica receptacles, and Diatomophyceae were very satisfactory. Studies of Xanthophycea should reveal new information about its structure. Few studies of the lorica of Euglenophyceae have been made. Studies of Chlorophyceae, especially Chlorococcales and desmids, show promise. (Buchanan-Davidson--Wisconsin).
W76-09225

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, MISSISSIPPI.
For primary bibliographic entry see Field 2L.
W76-09238

PHASE II: HYDROLOGY,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09240

CANADIAN EXPERIENCE WITH THE REDUCTION OF MERCURY AT CHLOR-ALKALI PLANTS,
Canadian Industries Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5G.
W76-09273

NEED FOR AN INTEGRAL APPROACH TO TO THE PROBLEM OF QUANTITATIVE DETERMINATION OF LIGNOSULFONIC ACIDS IN MILL EFFLUENTS AND SURFACE WATERS (O POTRZEBIE KOMPLEKSOWEGO UJMOWANIA PROBLEMU ILOSCIOWEGO OZNACZANIA KWASOW LIGNINOSULFONOWYCH W SCIEKACH POCELULOZOWYCH I WODACH POWIERZCHNIOWYCH),
Instytut Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Gliwice (Poland).
S. Jurkiewicz.
Przeglad Papierniczy, Vol. 31, No. 10, p 387-391, October, 1975. 3 fig, 29 ref.

Descriptors: *Pulp wastes, *Lignins, *Water analysis, Analytical techniques, Water pollution sources, Wastes, Industrial wastes, Surface waters, Chemical analysis, Instrumentation, *Pollutant identification, Organic compounds, Colorimetry, Sulfonates, Effluents.
Identifiers: *Lignosulfonic acids, Sulfite pulp mills.

Among many available analytical methods for the quantitative determination of lignin compounds, a standard method is still lacking. One reason for this situation is that many of the methods developed are suitable only for a given type of effluent or surface water under specified conditions. The development of a universal analytical method requires the consideration of various factors, such as the type of effluent or surface water, the nature of impurities and their effect on lignin determination, the type of standard used, and the conditions of the determination (medium, pH, concentration of chemicals used, etc.). These factors are discussed with respect to lignosulfonic acids and instrumental determination methods. Present standardization attempts based on colorimetric determinations and substitute standards (tannins) and the reliability of the conversion factors must be demonstrated. Elimination of interfering impurities by dilution or, in the case of very low lignosulfonic acids concentrations, by ether extraction, appear promising. (Stapinski-IPC)
W76-09277

PHENOLS -- PRODUCTS OF LIGNIN DEGRADATION -- IN EFFLUENTS OF THE BAIKAL PULP AND PAPER MILL (FENOLI -- PRODUKTY RAZRUSHENIYA LIGNINA -- V STOCHNYKH VODAKH BAIKAL'-SKOGO TSELLYULOZNOGO ZAVODA),
Leningradskaya Lestekhicheskaya Akademiya (USSR).
Yu. I. Chernousov, V. M. Nikitin, and V. N. Piyalkin.
Khimiya i Ispol'zovanie Lignina (Chemistry and Utilization of Lignin), Riga, 1974, p 390-396. 18 ref, 2 tab.

Descriptors: *Phenols, *Pulp wastes, *Lignins, Wastes, Industrial wastes, Water pollution sources, Chemical analysis, Gas chromatography, Biological treatment, Aeration, Analytical techniques, Waste water treatment, Organic compounds, Pine trees, Softwood, Coniferous trees, Effluents, Bleaching wastes, *Pollutant identification.
Identifiers: *Lake Baikal(USSR), Guaiacol, Larch trees(Larix), Black liquor, Kraft mills, Spent pulping liquors.

Chemical methods and gas chromatography were used to determine the contents of phenols, products of lignin degradation, in black liquors from prehydrolysis-kraft pulping of pinewood and larchwood, the amounts of phenols in effluents from individual plants of the pulp mill and from the paper mill, and their content in purified effluents, which are discharged into Lake Baikal. Guaiacol was found to constitute 50% of the phenols in black liquors. The content of phenol in black liquors was less than 0.5%. At least 15 individual compounds were separated and identified in black liquors. The total amount of phenols contributed by the pulp mill, the bleach plant, and the paper mill was over 195 g/ton of pulp, the largest amount being contributed by the evaporation plant. Following biological and chemical purification and passage through the aeration ponds, the reduction of total phenols content was 93.2%, of monohydric phenols 95.2%, of polyhydric phenols and their derivatives 90%, and of phenol 100%. Considering dilution at the point of deep discharge into the lake, the content of phenols in the lake water at the discharge point did not exceed 0.001 mg/liter. The procedures used for the isolation and separation of the phenols are described, and the analytical data obtained are tabulated. (Stapinski -- IPC)
W76-09281

FILTER MEDIA COMPARISON AT PRINCE GEORGE PULP AND PAPER (LIMITED),
Prince George Pulp and Paper Ltd. (British Columbia).
For primary bibliographic entry see Field 5D.
W76-09286

STANDARDIZATION OF METHODS FOR THE DETERMINATION OF TRACES OF SOME VOLATILE CHLORINATED ALIPHATIC HYDROCARBONS IN AIR AND WATER BY GAS CHROMATOGRAPHY,
Bureau International Technique des Solvants Chlores, Brussels (Belgium).
A. A. Deetman, P. Demeulemeester, M. Garcia, G. Hauck, and J. I. Hollies.
Analytica Chimica Acta Vol. 82, No. 1, p 1-17, March, 1976. 3 fig, 19 ref, 1 tab.

Descriptors: *Chlorinated hydrocarbon pesticides, *Water analysis, *Gas chromatography, Water pollution sources, Analytical techniques, Organic compounds, Chemical analysis, Chromatography, Trace elements, Air pollution, *Pollutant identification, Pollutants.

Methods are described for the routine determination of some volatile chlorinated aliphatic hydrocarbons (such as chloroform, carbon tetrachloride, tri- and perchloroethylene, penta- and hexachloroethane) in environmental samples of air and water. The procedures are based on gas chromatography with electron-capture detection. The chlorinated compounds are determined in the ranges 1-100 ng/liter of air and 0.01-10 micrograms/kg of water. The overall repeatability of both methods is 20% relative. The procedures are easily adapted to the determination of other volatile halogenated materials. (Witt-IPC)
W76-09287

PRACTICAL APPLICATION OF THE TOXICITY EMISSION RATE CONCEPT IN A SURVEY OF MARITIME PULP AND PAPER MILLS,
R. C. H. Wilson, R. H. Cook, and E. Pessah.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P. Q.), p 33-38. 2 fig, 14 ref, 5 tab.

Descriptors: *Toxicity, *Pulp wastes, *Biological treatment, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution effects, Canada, Foreign countries, Sulfite liquors, Water pollution control, Pulp and paper industry.
Identifiers: Groundwood mills, Kraft mills, Sulfite mills.

The toxic emissions of effluents from seven pulp and paper mills in eastern Canada were quantified prior to and following biological treatment. A toxicity emission index (TEI) defined as the mass emission of toxicants produced by a unit of production is proposed. It was found that the TEI was lowest at groundwood operations and highest at bleached sulfite pulp mills. The TEI was reduced across well-operated secondary treatment systems. It is suggested that the TEI is a tool which may be useful in the framing of a quantitative toxicity requirement in effluent regulations and in the characterization of treatment system performance. Because of the paucity of usable data, however, its application to either function would have to be preceded by intensive data gathering. Further it is evident that the acute lethal bioassay is too insensitive to quantify precisely the toxicity reduction attainable through the secondary treatment of kraft mill wastes. (Witt-IPC)
W76-09293

CHEMICAL CHARACTERISTICS, ACUTE TOXICITY AND DETOXIFICATION OF FOAM IN TWO AERATED LAGOONS,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Sweltzer Creek Salmon Research Lab.
For primary bibliographic entry see Field 5C.
W76-09295

COLOUR MEASUREMENT OF PULP MILL EFFLUENTS,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
J. Dorica, V. Berzins, and S. Prahacs.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 57-64. 8 fig, 21 ref, 6 tab.

Descriptors: *Color, *Pulp wastes, *Water analysis, Water quality, Water properties, Water quality standards, Water pollution sources, Industrial wastes, Wastes, Hydrogen ion concentration, Filtration, Filters, Light, Absorption, Standards, Water pollution, Colorimetry, Effluents.

This report summarizes the results of preliminary experimental studies, and subsequent round-robin tests, which lead to drafting of a new CPPA Technical Section Standard, H.5P, for the measurement of pulp mill effluent color. The procedure adopted involves sample pretreatment, including the adjustment of pH to 7.6, filtration first through a coarse glass fiber filter and then through a membrane filter having a nominal pore size of 0.8 micron, followed by measurement of light absorbance at a wavelength of 465 nm. Color is expressed in arbitrary color units based on the light absorbance by Pt-Co standard solutions at the same wavelength. (Witt-IPC)
W76-09296

PROCEEDINGS OF JOINT CONFERENCE ON PREVENTION AND CONTROL OF OIL SPILLS, MARCH 13-15, 1973, WASHINGTON, D.C.,
American Petroleum Inst., Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-09312

ON SPENT SEMICHEMICAL PULPING LIQUORS. (4) XYLAN IN NEUTRAL SULFITE SEMICHEMICAL SPENT LIQUOR (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
For primary bibliographic entry see Field 5C.
W76-09338

FLOW INJECTION ANALYSIS. PART IV. STREAM SAMPLE SPLITTING AND ITS APPLICATION TO THE CONTINUOUS SPECTROPHOTOMETRIC DETERMINATION OF CHLORIDE IN BRACKISH WATERS,
Centro de Energia Nuclear na Agricultura, Sao Paulo (Brazil).
J. Ruzicka, J. W. B. Stewart, and E. A. Zagatto.
Analytica Chimica Acta, Vol. 81, No. 2, p 387-396, February, 1976. 6 fig, 8 ref, 1 tab.

Descriptors: *Chlorides, *Brackish water, *Water analysis, *Spectrophotometry, Analytical techniques, Water pollution sources, Saline water, Inorganic compounds, *Pollutant identification.

The rapid determination of chloride in water samples based on spectrophotometric measurement of iron (III) thiocyanate has been adapted to flow injection analysis. (cf. Analytica Chimica Acta, Vol 78, p. 145-157, 1975). The simple manifold allows a routine sampling rate of 300 samples/hr, and evidence is presented that 500 samples/hr are possible. For increased accuracy in the measurement of samples of widely varying chloride content, the sample is split in the reagent stream so that the relevant absorbance of the split sample zones varies from 1:2 to 1:10, allowing expansion of the analytical range without loss of accuracy. (Witt-IPC)
W76-09339

WATER MONITORING - JIM BRIDGER PROJECT - SWEETWATER COUNTY, WYOMING,
Fox (F. M.) and Associates, Inc., Wheat Ridge, Colo.
B. A. Florquist, and P. A. Hilbelink.
Ground Water, Vol. 14, No. 3, p 157-162, May-June, 1976. 2 fig, 1 tab, 4 ref.

Descriptors: *Water quality, *Dissolved solids, *Monitoring, *Data collection, *Observation wells, Turbidity, Water, Temperature, Hydrogen ion concentration, Dissolved oxygen, Phenols, Ammonia, Lead, Groundwater, Subsurface flow, Surface waters, Evaporation, *Wyoming, Pollutant identification.
Identifiers: Jim Bridger Project(Wyo), *Groundwater levels, *Monitoring wells, Sweetwater County(Wyo).

Beginning in February of 1974 and continuing through the start-up of the first generating unit at the Jim Bridger Power Plant on August 8, 1974, monitoring holes were drilled, water samples were taken, water quality was evaluated, and groundwater levels were measured. Over 25 water quality stations were monitored. Most of the monitoring wells were drilled into Tertiary or Cretaceous sedimentary rock. Surface water monitoring sites were located on two major streams, the fresh water surge pond and the evaporation ponds that receive the blow-down water from the cooling towers. These waters were analyzed for at least 21 minerals and/or ions as well as for pH, dissolved oxygen, turbidity, temperature and such exotics as phenols, hydrazine and ammonia. Seven of the nine toxic substances cited by the Public Health Service standards were analyzed. Lead levels were excessive during some months at all well sites. The water quality was found to have a definite relationship to the geology of the area. (Heiss-NWWA)
W76-09349

INTERACTION BETWEEN SURFACTANT AND DYE IV. APPLICATION OF THE ACRIDINE ORANGE METHOD TO THE SURVEY OF POLLUTION OF ALKYLBENZENE SULFONATE IN RIVERS AND THE SURVEY OF WATER POLLUTION IN KINOKAWA,
Wakayama Prefectural Inst. of Public Health (Japan).
T. Yokoyama, S. Tokutsu, and H. Tsuiisawa.
Eisei Kagaku, (The Journal of Hygienic Chemistry), Vol. 21, No. 6, p 365-368, December, 1975. 4 fig, 3 tab.

Descriptors: *Analytical techniques, *Pollutant identification, *Path of pollutants, Alkylbenzene sulfonates, Rivers, *Surfactants, Monitoring, *Dyes.
Identifiers: Acridine orange.

A previously tested acridine orange method for determining alkylbenzene sulfonate has been applied to a survey of pollution in river water. Although the proposed method gave slightly higher values than the standard method using methylene blue, it was better because of its small coefficient of variation. It was concluded from the results of the survey that the proposed acridine orange method should be routinely available for the survey of alkylbenzene sulfonate pollution in river water. (Kramer-FIRL)
W76-09364

PHOSPHATE DETERMINATIONS IN WATERS USING AN ANION EXCHANGE RESIN,
Missouri Agricultural Experimental Station, Columbia.
R. W. Blanchar, and D. Riego.
Journal of Environmental Quality, Vol. 4, No. 1, p 45-49, January-March 1975. 5 fig, 4 tab, 10 ref. OWRT B-051-MO(3).

Descriptors: *Phosphates, Water quality, Water quality control, *Pollutant identification, Sampling, *Anion exchange, Analytical techniques.
Identifiers: *Phosphate analysis.

Amounts of water samples from 1 to 1000 ml were passed through 10-cc columns of 100- to 200-mesh Dowex 1-X8 anion-exchange resin. Orthophosphate was quantitatively removed from the water sample by the resin and could be eluted from the column with 25 ml of 1M KCl. Phosphate in the 1M KCl eluent was reacted with ammonium molybdate, extracted into isobutanol, reduced with SnCl (2), and the optical density of the blue complex measured. The working range of the method was between 1 and 8 micrograms of P. Analysis of water samples indicated that in the 1 to 20 ppb P range an appreciable amount of the phosphate exists as pyro- and tripoly-phosphate. The resin method is not specific for dissolved orthophosphate in water, but may give a more valid estimate than direct reaction with the acid molybdate reagent. (Skogerboe-Colorado State)
W76-09370

DEVELOPMENT OF A WATER QUALITY INSTRUMENTATION PACKAGE FOR LONG-TERM OPERATION FROM BUOYS AND OTHER UNATTENDED MARINE PLATFORMS,
National Marine Fisheries Service, Washington, D.C. Data Buoy Office.
For primary bibliographic entry see Field 5G.
W76-09372

COMPARISON OF TWO METHODS FOR DETERMINATION OF PRIMARY PRODUCTIVITY ON COASTAL WATERS OF THE GULF OF MEXICO, (IN SPANISH),
Universidad Nacional Autonoma de Mexico City. Instituto de Biologia.
E. Jordan.
An Inst Biol Univ Nac Auton Mex Ser Cienc Mar Limnol. 43(1), p 21-32, 1972.

Descriptors: *Gulf of Mexico, *Primary productivity, Mexico, Coasts, *Pollutant identification, Methodology.
Identifiers: Carbon-14, Technique.

Measurements of primary productivity rates were made in coastal waters of the Gulf of Mexico between Tamaulipas and a reef on Campeche Bank as part of the continuing marine program of the Instituto de Biologia, Universidad Nacional Autonoma de Mexico. Both the 14C and the 'light and dark bottle' methods were used simultaneously, to measure primary production rates in land-influenced coastal waters, in order to evaluate the reliability and accuracy of the 2 techniques. The $14C^{1}$ method is more reliable for coastal waters, but 2 techniques or more should be used simultaneously to best evaluate the production data.--Copyright 1975, Biological Abstracts, Inc.
W76-09391

A NEW DEVICE FOR SUBSAMPLING PLANKTON SAMPLES,
South Carolina Marine Resource Research Inst., Charleston.
For primary bibliographic entry see Field 7B.
W76-09396

A METHOD FOR THE RAPID SORTING OF PLANKTON INTO A NUMBER OF SIZE GROUPS,
Oslo Univ. (Norway). Inst. of Marine Biology; and Olso Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 7B.
W76-09397

5B. Sources Of Pollution

BIODEGRADATION OF POLYNUCLEAR AROMATIC HYDROCARBON POLLUTANTS BY SOIL AND WATER MICROORGANISMS,
Illinois Univ. at Urbana-Champaign. Dept. of Microbiology.
E. J. McKenna, and R. D. Heath.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 964, $4.00 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 113, April 1976. 25 p, 4 tab, 7 fig, 45 ref. OWRT A-073-ILL(1) USDI 14-31-0001-5013.

Descriptors: *Biodegradation, *Aromatic compounds, Pollutants, *Soil microorganisms, *Aquatic microorganisms, Oil spills, Coal conversion, Enzymes, *Oxidation.
Identifiers: *Polynuclear aromatic hydrocarbons, Carcinogenic chemicals.

Polynuclear aromatic hydrocarbons (PNAs) are widely distributed in natural soils and waters and further are introduced into the environment by, e. g., oil spills and coal conversion processes. Since these toxic chemicals not only persist in nature but also can be converted into a carcinogenic agent in the animal, their complete removal or transformation to a harmless species is important. This study (1) delineated the structural limits of PNA degradability by measuring initial rates of aromatic hydrocarbon oxidation by soil and water microorganisms and (2) determined the persistence of selected PNAs by measuring percent remaining hydrocarbon in the presence of pure and mixed microbial cultures as a function of time and by demonstrating the appearance of metabolic products. Extensive removal of potentially carcinogenic PNAs can be effected even by the very dilute microbial suspensions found in natural waters. Since bacterial degradation of aromatic hydrocarbons does not produce a carcinogenic species, it may be that in the natural environment microbes exert a protective effect on higher organisms by continuously removing these potentially harmful chemicals from the biosphere. It is anticipated that an assessment of the biodegradability of PNAs will be of assistance to bioengineers responsible for waste management in coal conversion plants and others concerned with abatement of PNA pollution of the environment.
W76-08752

THE EFFECTS OF WASTE WATER DIVERSION ON HEAVY METAL LEVELS IN THE SEDIMENTS OF A LARGE URBAN LAKE,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. E. Spyridakis, and R. S. Barnes.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 796, $4.00 in paper copy, $2.25 in microfiche. Completion Report, April 15, 1976. 33 p, 7 fig, 3 tab, 21 ref. OWRT A-070-WASH(1) 14-31-0001-5048.

Descriptors: *Heavy metals, *Sewage, Diversion, Sediments, Copper, Zinc, Lead, History, Environmental effects, Lakes, Sediments, Mass balances,

*Washington, *Lake sediments, Urbanization, Cities.
Identifiers: *Lake Washington(Wash), Sediment traps, Urban lakes.

The effects of wastewater diversion on the levels of lead, copper and zinc in the profundal sediments of Lake Washington, a large urban lake, were examined using sediment cores and sedimentation rates based on 210 Pb dating. Estimates of current and past trace metal loadings were made based on sediment cores, sediment trap, water, rainfall/dustfall samples and sedimentation rates. Copper and zinc levels in the profundal sediments were found to respond promptly to the diversion of an estimated 14.3 mgd of secondary sewage effluents. Contemporary profundal surface sediment concentrations of 46 mg/kg Cu, 192 mg/kg Zn and 192 mg/kg Pb are 28%, 20%, and -22% lower, respectively, than levels in prediversion sediments. The increase in lead discharges to the lake from general area sources was found to more than offset any decrease in lead resulting from diversion. A sample mass balance for copper, zinc and lead shows that aeolian input account for 47, 10, and 74% respectively of the total inputs to the lake. Based on the fraction of total metal inputs to the lake retained in the profundal sediments, entering Pb, Cu and Zn were removed to the sediments with 67, 38 and 19% efficiencies respectively.
W76-08754

A SIMULATION MODEL OF BIOPHYSIOCHEMICAL TRANSFORMATIONS OF NITROGEN IN TILE-DRAINED CORN BELT SOIL,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
J. Duffy, C. Chung, C. Boast, and M. Franklin.
Journal of Environmental Quality, Vol. 4, No. 4, p 477-486, October-December 1975. 8 fig, 1 tab, 30 ref.

Descriptors: *Model studies, *Simulation analysis, *Nitrogen, Corn(Field), *Drainage, Water quality, Nitrification, Denitrification, Evapotranspiration, Crop response, *Computer models, Path of pollutants, Soils, *Corn belt.

A computer simulation model of nitrogen transformations and transport in soil in a Corn Belt field was developed to predict nitrate concentrations in tile effluent as a function of farm management practices and climatic conditions. Water flow in the unsaturated and saturated zones, evapotranspiration, and nitrogen flow due to mass flow, dispersion, and diffusion are simulated along with nitrogen transformations of mineralization, immobilization, nitrification, and denitrification. Growth of corn and soybeans is included. Predicted values of tile water flow, water table height, nitrate -nitrogen concentrations in the soilwater profile and in the tile effluent compared favorably to measured values for 2 field for 1972; also, predic tions of nitrate-nitrogen concentrations in tile effluent for 1970-71 agree well with actual data. (Skogerboe-Colorado State)
W76-08761

SOLUBLE SALTS AND NITRATE DISTRIBUTION IN IRRIGATED LETTUCE BEDS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3C.
W76-08763

NATURAL (15)N ABUNDANCE IN SOIL, LEAVES, AND GRAIN AS INFLUENCED BY LONG TERM ADDITIONS OF FERTILIZER N AT SEVERAL RATES,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W76-08765

RIVER POLLUTION BY ANTICHOLINESTERASE AGENTS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W76-08782

TRACE ELEMENT POLLUTION IN STREAMS OF NORTHWESTERN U.S.A.,
For primary bibliographic entry see Field 5A.
W76-08797

PHOSPHORUS AVAILABILITY IN PARTICULATE MATERIALS TRANSPORTED BY URBAN RUNOFF,
Wisconsin Univ., Madison. Water Chemistry Program.
W. F. Cowen, and G. F. Lee.
Journal Water Pollution Control Federation, Vol. 48, No. 3, p 580-591, March 1976. 4 fig, 5 tab, 19 ref. EPA R-800537.

Descriptors: *Phosphorus, *Urban runoff, *Phosphorus compounds, *Water pollution sources, Urban drainage, Phosphates, Inorganic compounds, Analytical techniques, Nutrients, Chemical analysis, Eutrophication, Water properties, Water quality, Storm runoff, Urbanization, Drainage systems, *Pollutant identification, Membranes, Filtration, Bioassay, Water pollution, Algae, *Path of pollutants, *Wisconsin.
Identifiers: Phosphorus availability, Particulate phosphorus, *Madison(Wis), Algal bioassays.

Samples of urban runoff were analyzed for dissolved reactive phosphorus, total soluble phosphorus, particulate phosphorus, and total phosphorus. Particles were isolated by membrane filtration and extracted with acid, base, and anion exchange resins, and the inorganic phosphorus in the extracts were compared with the particulate phosphorus extracted. Ranges of group mean values for various urban land uses were 33 to 46, 22 to 27, and 13 to 17% of particulate phosphorus for acid, base, and resin extractions, respectively. Bioassays with Selenastrum capricornutum showed a range of 8 to 55% of particulate phosphorus available to the algae. Long-term aerobic incubations of unfiltered runoff with resin generally showed the same percentage of particulate phosphorus extractable by resin as did short-term extraction. At most 30% of the particulate phosphorus should be considered available to algae in the receiving water. (Henley-ISWS)
W76-08804

AREAL AND SEASONAL VARIATIONS IN THE CHEMISTRY OF SUSPENDED PARTICULATE MATTER IN A DEEP WATER FJORD,
Endinburgh Univ. (Scotland). Grant Inst. of Geology.
For primary bibliographic entry see Field 2L.
W76-08829

KINETICS AND MECHANISMS OF THE OXIDATIVE DEGRADATION OF NITRILOTRIACETIC ACID (NTA) IN AQUEOUS SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
S. B. Hanna.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 772 $3.50 in paper copy ,$2.25 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, April 1976. 13 p, 4 fig, 6 ref. OWRT A-081-MO(1), 14-31-0001-4025.

Descriptors: *Oxidation, *Chemical degradation, Amno acids, Water pollution, *Kinetics, Detergents, *Nitrilotriacetic acid, *Chemical reaction, Industrial wastes, Waste water treatment, Aqueous solutions.

The stoichiometry of the reaction between Ce(IV) and NTA in HClO4 media was determined. Degradation was rapid. The decomposition products included CO2, formaldehyde, iminodiacetic acid, glycine and an amine component. Rate of reaction measurements were made using three oxidizing agents, Ce(IV), permanganate (MnO4) and hypochlorite (OCl). The hypochlorite oxidation appears the most promising for use in both potable and waste water treatment. The work provides basic chemical data on degradation of NTA. The findings have practical application in chemical industries that use NTA as a chelating agent. (Smith - Missouri)
W76-08843

ENVIRONMENTAL EFFECTS OF COOLING SYSTEMS AT NUCLEAR POWER PLANTS,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-08848

A TWO-DIMENSIONAL HYDRODYNAMIC MODEL FOR COOLING-TOWER PLUMES,
Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen (Switzerland).
J. P. Trepp.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 37-44, 1 fig, 11 ref.

Descriptors: *Model studies, *Cooling towers, *Environmental effects, Temperature, Humidity, Rain, Clouds, Winds, Microclimatology, Microenvironment, *Computer models.

The computer model, simulating the cooling-tower plume, solves numerically the time-dependent equations of motion, continuity and those that describe the transport of heat, water vapour and water droplets for the lower atmosphere. The final aim of the model is to evaluate the climatic changes in the nearer surroundings of a cooling tower or of a whole cooling-tower system. The models calculate the changes in temperature, humidity, wind, and droplet spectrum (including cloud water and rain). From these changes the effect on the micro climate can be deduced. Experimental verification is required especially of the parameters used in the turbulent transport terms. (See also W76-08848)
W76-08851

COMBINED DRY/WET-COOLING TOWERS: THEIR ENVIRONMENTAL PROMISE AND THEIR PROBLEMS,
Motor-Columbus Consulting Engineers Inc., Baden (Switzerland).
P. Bogh, and N. Bhargava.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 45-62, 11 fig, 1 tab, 4 ref.

Descriptors: *Model studies, *Cooling towers, *Environmental effects, Nuclear powerplants.
Identifiers: *Plumes.

A model program, SAMOA, which is a combination of wet-cooling tower program and dry tower program was used as a tool to study the dry/wet-cooling tower plume. In some cases, the visible plume of the dry/wet-cooling tower was even larger than for the wet tower of the same capacity. The most important result of the prelimnary studies performed is that a superheating of the plume at tower outlet is a necessary but not sufficient condition for plume reduction. It is also necessary to ensure a rapid mixing of the plume with environmental air to reduce plume rise in order to reduce adiabatic cooling and mixing with cold air. A method to obtain this rapid mixing consists in distributing the cooling power over several smaller towers. (See also W76-08848) (Chilton-ORNL)

W76-08852

ATMOSPHERIC DISPERSION OF COOLING-TOWER BLOWDOWN,
Environmental Systems Corp., Knoxville, Tenn.
G. O. Schrecker, S. L. Williams, and F. M. Shofner.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 63-74, 2 tab, 7 ref.

Descriptors: *Environmental engineering, *Cooling towers, *Particle size, Distribution, Dispersion, Air pollution effects.
Identifiers: Cooling tower blowdown.

Atmospheric dispersion of blowdown is accomplished by injecting the blowdown through spray nozzles into the exhaust air flow of the cooling tower. An extensive data base on local meteorology, ambient airborne mineral concentration, mineral composition of the cooling water, spray-nozzle particle-size distribution and load schedule of the cooling tower is essential in evaluating application to specific sites. The paper demonstrates that the particle-size distribution of entrained droplets is fundamentally important in evaluating environmental effects. (See also W76-08848) (Chilton-ORNL)
W76-08853

COMPUTATIONS OF THE TEMPERATURE RESPONSE OF STRATIFIED SILL FJORDS TO COOLING-WATER DISCHARGES,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
T. Audunson, J. Land, and H. Rye.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 113-140, 15 fig, 1 tab, 20 ref.

Descriptors: *Model studies, *Numerical analysis, Environmental effects, Cooling water, Temperature, Fjords.

A numerical analysis of thermal effects on seasonal temperature cycles in stratified sill fjords is described which takes into account spatial and temporal variations in the vertical eddy diffusion coefficient and in the horizontal in- and out-flows to the fjords. The fjords are considered in connection with the siting of a nuclear power station in the Oslofjord area. Temperature, salinity and wind-shear effects on the vertical diffusion coefficient are considered through an assumed functional relationship between the vertical diffusion coefficient and the stability of the water column. Two cases were considered; one which the heated effluent was convected from the discharge area into a semi-enclosed sill fjord, and one in which the discharge was located within a semi-enclosed sill fjord. In the first case, measurements showed that the effluent may form either deep or surface water inside the fjord depending upon the time of the year. In the second case, results showed that the excess temperature from thermal discharges are strongly dependent upon the water-exchange across the sills. The investigation demonstrates that the observed yearly mean temperature cycle may be simulated to within 1 degree C with a one-dimensional numerical model. (See also W76-08848) (Chilton-ORNL)
W76-08857

HEAT DISCHARGES INTO THE SEA AT THE OLKILUOTO SITE: LABORATORY MODEL TEST RESULTS AND REASONS FOR SELECTED ARRANGEMENTS,
Teollisuuden Voima OY Industrins Kraft Ab. Kile (Finland).
I. Mikkola.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 141-150, 8 fig, 2 ref.

Descriptors: *Model studies, *Environmental effects, *Cooling water, Design criteria.

A laboratory model of an area of 20 km by 11.5 km of the Gulf of Bothnia was built to a scale of 1 : 500. Different cooling arrangement designs are presented and the results are compared to the jet-stream theory and control observations. The aim of the cooling system arrangements sought by means of laboratory tests was to minimize water temperature changes-to prevent recirculation, minimize heated areas, to get the warm water to float on the surface in such directions that the effects on summer resorts and professional fishing are minimal. (See also W76-08848) (Chilton-ORNL)
W76-08858

HEATING OF ESTUARINE AND COASTAL WATERS BY NUCLEAR POWER STATIONS IN FRANCE, (ECHAUFFEMENT DES EAUX PAR DES CENTRALES NUCLEAIRES EN ESTUAIRE ET BORD DE MER EN FRANCE),
Laboratoire National d'Hydraulique, Chatou (France).
A. Daubert.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 151-162, 6 fig.

Descriptors: *Model studies, *Environmental effects, Mathematical models, Cooling water, Nuclear powerplants, Temperature, Velocity, Estuarine environment, Coasts.

The induced heating of water at several sites which are under consideration for the construction of nuclear power stations was studied. Average convection and dispersion, which cause heated waters to spread over a surface, and atmospheric exchange which produces heat transfer through the surface, were the principal factors studied. The velocity field was obtained by means of mathematical models or directly by on-site measurements. The temperature field was calculated by means of mathematical models in all cases. Results are given for an estuarine site, a site on a straight coastline, and a site sheltered by a harbour. (See also W76-08848) (Chilton-ORNL)
W76-08859

THE CHALK POINT COOLING TOWER PROJECT,
Maryland Dept. of Natural Resources, Annapolis. Power Plant Siting Program.
J. Pell.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 187-216, 7 fig, 4 tab, 36 ref. AT(11-1)-2381.

Descriptors: *Environmental effects, *Thermal pollution, Monitoring, Mathematical models, Saline water, Vegetation effects, Maryland.
Identifiers: Chalk Point Cooling Tower Project(Md).

The goals of the Chalk Point Cooling Tower Project are to fully characterize the effluent plume discharged to the atmosphere for assessment of the environmental impact of such hyperbolic cooling towers. Factors such as fogging, precipitation enhancement, and downwind icing were studied as well as possible effects on vegetation and man-made structures by the deposition of salts from saline water drift. An intensive monitoring program was conducted together with ground observations by stereo photography, on-site meteorological observations, a major vegetation effects and mathematical modeling program, and airborne instrumentation. (See also W76-08848) (Chilton-ORNL)
W76-08861

UNITED KINGDOM EXPERIENCE OF THE PHYSICAL BEHAVIOUR OF HEATED EFFLUENTS IN THE ATMOSPHERE AND IN VARIOUS TYPES OF AQUATIC SYSTEMS,
Central Electricity Generating Board, London (England).
G. Spurr, and R. A. Scriven.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 227-248, 8 fig, 1 tab, 20 ref.

Descriptors: *Environmental effects, *Nuclear powerplants, *Thermal pollution, Cooling towers, Fog, Precipitation(Atmospheric).

In England and Wales the mean load density in terms of megawatts generated per unit area is considerably higher than in the US and in Europe. A long coast line and a large tidal range have been advantageous in locating power stations on the sea coast and in estuaries. Inland sites employ the use of natural-draught cooling towers. This paper describes studies on heat dispersion from a water surface to the atmosphere and dispersion by direct discharges. The potential environmental effects of cooling towers are identified as the effect on the frequency of ground fog and high relative humidity, precipitation due to drift or carry over and visual interference of the towers and their persistent water plumes. (See also W76-08848) (Chilton-ORNL)
W76-08863

A MODEL FOR SALT DRIFT DEPOSITION FROM SPRAY PONDS,
Massachusetts Institute of Tech., Cambridge.
E. C. Guyer, and M. W. Golay.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 331-345, 4 fig, 1 tab, 7 ref.

Descriptors: *Model studies, *Salts, *Dispersion, Sprays, Saline water, Nuclear powerplants, Drops(Fluids), Ponds.
Identifiers: *Salt drift deposition.

The drift dispersion model developed and applied to salt water spray ponds is seen to be adequate for the estimation of the time-averaged environmental salt deposition providing that some means for describing the drift-droplet source is available. The proposed model also allows the prediction of the effect of variations in the parameters which characterize the drift-droplet dispersion processes. However, the time-averaged salt deposition rates calculated using the proposed model may differ substantially from the actual instantaneous deposition rates. The major problem associated with the prediction of the salt deposition from spray ponds was the description of the drift source. (See also W76-08848) (Chilton-ORNL)
W76-08866

THE TOTAL HEAT-EXCHANGE COEFFICIENT OF SURFACE WATERS,
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
F. Gunneberg.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 347-355, 3 fig, 1 tab, 3 ref.

Descriptors: *Heat balance, *Mathematical studies, Surfaces, Temperature, Thermal pollution, Surface waters.
Identifiers: Heat exchange coefficient.

The total heat-exchange coefficient, A, together with water depth or river discharge, yields the

relaxation time or the relaxation surface which describes temperature developments by exponential functions. The paper sites four methods by which the coefficient, A, can be evaluated: (1) from the temperature difference between an undisturbed and a thermally leaded water body under the same conditions, (2) from the lapse of temperature down a river subjected to a heat inflow at one point, (3) from the change in temperature of a water body after an abrupt change in weather conditions, and (4) from the investigation of the individual physical processes which make up the heat exchange. Examples are given for all four procedures. (See also W76-08848) (Chilton-ORNL)
W76-08867

TWO METHODS OF MEASURING THE HEAT DISSIPATION OF DISCHARGED COOLING WATER: A PHENOMENOLOGICAL APPROACH,
Keuring van Electrotechnische Materialen N.V., Arnhem (Netherlands). Environmental Dept. of the Central Lab.
H. E. Sweers.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants,CONF-740820, Proceedings of a Symposium held at Oslo, August 26-30, 1974. p 357-367, 7 fig, 1 tab, 2 ref.

Descriptors: *Heat balance, *Cooling water, Temperature, Air-water interfaces, Diurnal, Dissipation, Measurement.
Identifiers: *Heat-exchange coefficient.

The coefficient of heat exchange at the air-water interface along the Amsterdam-Rhine canal was measured by the heat wave method and by the natural temperature method. The movement and decay of heat waves from two power plant discharges was followed and used to calculate the heat-exchange coefficient. In an area not influenced by thermal discharges, daily variations in the natural temperature of the canal were correlated to the daily mean difference between air and water temperature. The heat-wave method is considered theoretically sound but it is applicabe only under very specific experimental conditions. The validity of the natural temperature method is not obvious since it rests on a number of hypotheses that cannot be justified physically. The preliminary data analysis suggests that the results are promising. The major advantage of the natural temperature method is its simplicity. (See also W76-08848) (Chilton-ORNL)
W76-08868

GROUND WATER PROBLEMS ASSOCIATED WITH WELL-DRILLING ADDITIVES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
C. D. Shew, and J. W. Keeley.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 223-230.

Descriptors: *Water resources, *Groundwater, *Drilling fluids, Wastes, Water pollution, Biodegradation, Anaerobic bacteria, DDT, Chemical degradation, Toxicity.
Identifiers: *Ground water contamination, *Drilling fluid additives, Aerobic bacteria, Waste treatment, Chemical by-product toxicity.

The importance of ground water is discussed along with the consequences of its degradation. Legislation governing ground water supplies is weak to non-existent. The concept of ground water is largely not understood by the public. Implications of its destruction are extremely hard to understand and more difficult to deal with. This is due principally to the very slow movement of ground water and the more subtle movements of pollutants. The subsurface is an extremely complex environment which changes dramatically in only short distances. Biological activity is of prime interest in the movement and fate of pollutants in the subsurface environment. Aerobic bacteria are principally responsible for waste stabilization in conventional treatment facilities. Anaerobic bacterial degrade DDT rather rapidly in a subsurface environment. In ground water, DDT does not migrate to any great extent, however, the question which concerns us is the solubility of the anaerobic degradation products. If they become free to move through the aquifer and are more toxic than the parent compound, then the microbes have behaved in a detrimental manner. (See also W76-08889) (Heiss-NWWA)
W76-08902

CHEMICAL APPLICATIONS IN OIL AND GAS WELL-DRILLING AND COMPLETION OPERATIONS,
Bartlesville Energy Research Center, Okla.
For primary bibliographic entry see Field 8G.
W76-08903

MOBILITY OF WELL-DRILLING ADDITIVES IN THE GROUND WATER SYSTEM,
National Water Well Association, Worthington, Ohio. Research Facility.
M. D. Campbell, and G. R. Gray.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 261-284, 9 fig, 47 ref.

Descriptors: *Water pollution, *Drilling fluids, Groundwater, Aquifer characteristics, Water wells.
Identifiers: *Groundwater contaminant behavior.

The components of the drilling fluid may enter and contaminate an aquifer through surface waters, outcrops, stream runoff, percolation and abandoned wells. Contaminants from the borehole may enter ground water as a consequence of lost circulation, seepage, filtration, or blowout. Contaminant behavior is determined by it properties, the characteristics of the aquifer and the interstitial water. Physical separation of suspended solids depend on particle size, shape, concentration, density and the porosity of the aquifer. Particle and gaseous adsorption in the reservoir are important and of a complexity seldom reconstructed in the laboratory. Introduction of drilling fluid materials into the ground water can be determined by the aquifer permeability and pressure gradient. These flow characteristics may be changed by the contaminants and their effect on existing aquifer conditions. (See also W76-08889) (Heiss-NWWA)
W76-08904

MOVEMENT OF CHEMICAL CONTAMINANTS IN GROUND WATER,
Dames and Moore, Park Ridge, Ill.
D. O. Gregg, and K. G. Kennedy.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 289-309, 6 fig, 1 tab, 8 ref.

Descriptors: Wastes, *Aquifer characteristics, Dispersion, Chemical degradation, Radioactive wastes, Groundwater movement, *Path of pollutants, Chemical wastes, Geochemistry, Chlorides, Darcys law.
Identifiers: Arsenic, Cyanide, Cesium 137, Strontium 90.

Ground water flow and dispersion are the means by which chemical contaminants move through aquifers. Darcy's equation can describe approximate ground water velocities in a homogeneous aquifer. More commonly, ground water flows through a locally heterogenious aquifer of variable permeability with variable gradients and recharge characteristics. Convection and dispersion further compound the uncertainties of accurately predicting contaminant movement rates in ground water. Contaminant concentration commonly decrease with time and distance from the source area. This dilution, depending on the contaminants, may be due to convection, dispersion, additional recharge, ion exchange, sorption, chemical precipitation, biological distruction or uptake, and radioactive decay. Ion exchange on clays and slits removes the more active cations such as calcium, cesium, sodium and arsenic from the solution. This mechanism is not readily effective for dissociated anions such as chloride or nitrate. Radioactive decay reduces the original concentrations of isotopes such as strontium 90, cesium 137 and tritium. (See also W76-08889) (Heiss-NWWA)
W76-08905

FIELD EVALUATION OF A PREDICTIVE MODEL FOR THERMAL STRATIFICATION IN LAKES AND RESERVOIRS,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W76-08920

PENETRATION AND MIXING OF HEATED DISCHARGES INTO WATERWAYS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
J. A. Schetz, C. H. Lewis, B. L. Sill, J. C. Chien, and D. Markham.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 957 $4.00 in paper copy, $2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 93, April 1976. 41 p, 23 fig, 15 ref. OWRT B-041-VA (7) and B-054-VA (3).

Descriptors: *Thermal pollution, *Mixing, *Heat transfer, *Jets, Numerical analysis, Path of pollutants, Diffusion, *Open channel flow, Model studies.
Identifiers: Multi-port diffuser, *Thermal discharge, Mixing zones.

Results are presented of a series of related studies of thermal discharges into water-ways and the resulting mixing zones. The first investigation involved the physical situation of a single, isolated horizontal jet discharge below the surface of a deep, moving channel. The results of laboratory experiments, approximate analysis and direct numerical solutions are reported for this physical situation. The second investigation considered the configuration of a tangential jet discharge along one bank of a shallow, moving channel. As with the first configuration, results are reported for laboratory experiments, approximate analysis and numerical solutions. In addition, limited comparisons between the predictions of the approximate analysis and some field measurements are provided. The final investigation was a comparative study of the effects of three more types of injector geometries for thermal discharges-a multiport diffuser, a single jet on the surface that is discharging perpendicular to the main channel flow, and a single jet resting on the channel bottom and also discharging perpendicular to the main flow. For these geometries, comparative data are provided on recirculation zones, hot spots, and surface temperature distributions.
W76-08926

RESEARCH ON THE MARINE FOOD CHAIN.
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08935

DYNAMICS OF PHOSPHORUS CYCLING IN THE EUPHOTIC WATERS OF THE CENTRAL NORTH PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08939

A THERMODYNAMIC MODEL FOR STEADY STATE METABOLISM OF PHYTOPLANKTON, PART I. THEORY,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08944

A THERMODYNAMIC MODEL FOR STEADY STATE METABOLISM OF PHYTOPLANKTON, PART II. LIGHT AND CARBON LIMITED GROWTH,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08945

CHLORINE REACTIONS WITH SEAWATER CONSTITUENTS AND THE INHIBITION ON PHOTOSYNTHESIS OF NATURAL MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08946

CYCLING OF ORGANIC CARBON IN THE OCEAN: USE OF NATURALLY-OCCURRING RADIOCARBON AS A LONG AND SHORT TERM TRACER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08956

CRUISE SUMMARY, A. SOUTHERN CALIFORNIA BIGHT STUDIES (SCBS).
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08960

CRUISE SUMMARY, B. GULF OF CALIFORNIA PHOTOBIOLOGY CRUISE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W76-08961

URBAN RUNOFF MODELLING,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Div.
For primary bibliographic entry see Field 4A.
W76-09033

EXPERIMENTAL STUDY OF THE EFFECT OF TEMPERATURE AND DEGREE OF OXYGEN SATURATION ON THE DESTRUCTION RATE OF SOLUBLE PROTEINS IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 5C.
W76-09078

PHOSPHOROUS FLUX THROUGH FISHES,
For primary bibliographic entry see Field 5C.
W76-09104

ALGAL COMMUNITIES IN POLLUTED RIVERS OF SOUTH WALES,
For primary bibliographic entry see Field 5C.
W76-09107

FIELD EVALUATION OF BENZOPYRENE HYDROXYLASE INDUCTION AS A MONITOR FOR MARINE PETROLEUM POLLUTION,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 5A.
W76-09116

THE AVAILABILITY OF 137-CS TO FISHES FROM INGESTED CLAYS,
For primary bibliographic entry see Field 5C.
W76-09118

ENDRIN TOXICITY AND DISTRIBUTION IN FRESHWATER: A REVIEW,
Bureau of Sport Fisheries and Wildlife, Marion, Ala. Southeastern Fish Cultural Lab.
For primary bibliographic entry see Field 5C.
W76-09122

GROUND-WATER LEVELS AND CHEMICAL QUALITY OF GROUND WATER IN LINCOLN, MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 7C.
W76-09132

HYDROLOGIC ENVIRONMENTAL EFFECTS OF SPRAYED SEWAGE EFFLUENT, TALLAHASSEE, FLORIDA,
Geological Survey, Tallahassee, Fla.
L. J. Slack.
Water-Resources Investigations 55-75, December 1975. 73 p, 14 fig, 13 tab, 37 ref.

Descriptors: *Path of pollutants, *Sewage effluents, *Aquifers, *Groundwater, *Florida, Hydrologic data, Water pollution sources, Sewage treatment, Water pollution effects, Water quality.
Identifiers: *Tallahassee(Fla).

Since 1966, Tallahassee has been experimentally disposing of the effluent from secondarily-treated sewage by spraying at the Thomas P. Smith Wastewater Renovation Plant. This report describes the disposal system, assesses the hydrologic and chemical effects of sewage effluent disposal on groundwater in the area around the plant, and provides data useful for the development of basic criteria for land disposal of sewage effluent. Based on average data (collected from July 1972 to June 1974) there was a reduction in concentration of approximately 12 mg/litre of the total nitrogen from the effluent which was applied at a rate of 2 to 8 in per week in an area with a cover crop. On the same basis there was an approximate concentration reduction of 5 mg/litre of the total nitrogen from the effluent applied at a rate of 14 in per week to an undisturbed forest. The high-rate application of effluent (14 per week) resulted in increased chloride and nitrogen concentrations to a depth of at least 270 ft in the underlying fresh-water aquifer. Effluent-percolate has moved from the plant at about 2,400 feet per year. As of June 1974 the leading edge of the waste front was between 1,800 and 4,000 ft downgradient from the plant and groundwater in about 140 acres of the underlying aquifer had increased in nitrate-N and chloride concentrations. (Woodard-USGS)
W76-09134

THE EFFECTS OF GROUND-WATER DEVELOPMENT ON THE WATER SUPPLY IN THE POST HEADQUARTERS AREA, WHITE SANDS MISSILE RANGE, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
T. E. Kelly, and G. A. Hearne.
Open-file report 76-277, April 1976. 97 p, 18 fig, 6 tab, 33 ref.

Descriptors: *Water pollution sources, *Groundwater mining, *Groundwater basins, *Military reservations, *New Mexico, Hydrologic data, Hydrogeology, Aquifer characteristics, Saline water intrusion, Pumping, Model studies, Water levels, Water quality, Projections, Groundwater resources, *Water supply.
Identifiers: White Sands Missile Range(N Mex).

Water-level declines in the Post Headquarters area, White Sands Missile Range, N. Mex., have been accompanied by slight but progressive increases in the concentration of dissolved solids in water withdrawn from the aquifer. Projected water-level declines through 1996 are estimated from a digital simulation model to not exceed 200 feet (61 metres). A conceptual model of water quality provides three potential sources for water that is relatively high in dissolved solids: brine from the Tularosa Basin to the east, slightly saline water beneath the subjacent aquatard, and very slightly saline water from the less permeable units within the aquifer itself. Management of the well field to minimize drawdown and spread the cone of depression would minimize the rate of water-quality deterioration. A well designed monitoring network may provide advance warning of severe or rapid water-quality deterioration. The Soledad Canyon area 10 miles (16.1 kilometres) south of the Post Headquarters offers the greatest potential for development of additional water supplies. (Woodard-USGS)
W76-09137

A TECHNIQUE FOR ESTIMATING THE TIME OF TRAVEL OF WATER IN INDIANA STREAMS,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 4A.
W76-09138

MACROSCOPIC BENTHIC FAUNA OF THREE TIDAL CREEKS ADJOINING THE RHODE RIVER, MARYLAND,
Geological Survey, Edgewater, Md.
J. M. Redding, and R. L. Cory.
Available from National Technical Information Service, Springfield, Va 22161 as PB-251 995 as $4.00 printed copy; $2.25 microfiche. Water-Resources Investigations 39-75, 1975. 23 p, 2 fig, 5 tab, 22 ref.

Descriptors: *Benthic fauna, *Estuaries, *Maryland, *Baseline studies, Environmental effects, Sediments, Biomass, Ecotypes, Tidal streams.
Identifiers: *Rhode River(Md), Fauna species diversity.

The macroscopic benthic fauna of three tidal creeks adjoining the Rhode River in Maryland were sampled between September 1972 and August 1973 using a modified 230 sq cm (6 in.) Eckman grab. A total of 7943 individuals were collected representing 15 different species. Faunal similarity between creeks was high, although the relative abundance of each species was quite variable. Within each creek, abundance, biomass, and species diversity were analyzed on the basis of sediment type. Two different communities were recognized. In all creeks, the sand biotope exhibited a more diverse community structure and a greater biotic capacity than the mud biotope. (Woodard-USGS)
W76-09143

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN SELECTED COAL-ENERGY AREAS OF UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09148

NITROGEN AND PHOSPHORUS LEVELS IN SOILS BENEATH SEWAGE DISPOSAL PONDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W76-09197

PHOTOGRAPHIC ANALYSIS OF WATER QUALITY CHANGES,
Georgia Univ., Athens.

For primary bibliographic entry see Field 5A.
W76-09199

FLOW VELOCITY AS A RATE DETERMINING FACTOR FOR SELF-PURIFICATION IN RIVERS (UBER DEN EINFLUSS DER STROMUNGSGESCHWINDIGKEIT AUF DIE SELBSTREINIGUNG IN FLIESSGEWAESSERN),
For primary bibliographic entry see Field 5F.
W76-09204

QUALITY CONTROL IN SEWAGE TREATMENT PLANT (GESUISHORIJO NO SHISHUTSU SEIGYO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
For primary bibliographic entry see Field 5D.
W76-09205

DISCHARGE OF TREATED WASTE WATER IN LAKES (DIE EINLEITUNG VON GEREINIGTEM ABWASSER IN SEEN),
H. Buhrer, and H. Ambuhl.
Schweizerische Zeitschrift fuer Hydrologie, Vol. 32, No. 2, p 347-369, 1975. 9 fig, 11 tab, 5 ref.

Descriptors: *Waste disposal, *Lakes, Waste dilution, Mixing, Path of pollutants, Discharge(Water), Outfall sewers, Outlets, Ultimate disposal.
Identifiers: Lake Constance(Switzerland).

A study was conducted to find the optimum means of discharging treated waste water into a lake. Paths of waste water discharged into a lake were traced four times. Waste water was marked with aluminum powder and the cloud in the lake was registered by an echo-sounder. One measurement was made at the beginning of the overturn period, the rest were taken during the stagnation period. It was found that if there is a steady current in the lake, the waste water drifts, in the form of a plume. If the lake is calm, it accumulates as a cloud at the pipe's mouth and can well up to the depth of bathing. To avoid such an accumulation, currents must be known. A discharge site should be placed only where currents are steady. Based on events measured at Lake Constance, the mixing of one part of waste water with five parts of lake water should be enough to limit the vertical movement to two meters. (Kramer-FIRL)
W76-09216

THE EFFECT OF ROAD DEICING SALTS ON SODIUM CONCENTRATION IN AN URBAN WATER COURSE,
York Univ., Downsview (Ontario). Dept. of Geography.
W. S. Scott.
Environmental Pollution, Vol. 10, No. 2, p 141-153, February, 1976. 4 fig, 1 tab, 11 ref.

Descriptors: *Water pollution sources, *Runoff, *Sodium, Streams, Lakes, Snowmelt, Water pollution, Urban runoff, Deicers, Salts, Canada.
Identifiers: De-icing salts, Toronto(Canada).

The amount of de-icing salts in a Metropolitan Toronto stream and their spatial and temporal pattern of movement were studied. The stream was sampled during two major thaws at frequent intervals and at many locations which were closely spaced. The highest sodium concentrations occurred immediately after a thaw period started. They increased as much as fiftyfold during one thaw. These high concentrations last no longer than a few days, due to rapid dilution by melting snow. Both thaws occurred after long cold periods when salt and snow accumulated on roadsides. Because the very soluble salts are flushed downstream, salt may accumulate in lakes and ponds further downstream. (Snyder-FIRL)
W76-09218

POSSIBLE INFLUENCE OF ATMOSPHERIC TRANSPORT ON THE TOTAL MERCURY CONTENT OF SOUTHEASTERN ATLANTIC CONTINENTAL SHELF SURFACE WATERS,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, R. E. Taylor, and E. M. Waiters.
Deep-Sea Research, Vol. 22, No. 9, p. 629-633, 1975. 1 fig., 3 tab., 9 ref. EPA R 800372.

Descriptors: *Winds, *Mercury, *Atlantic Ocean, *Continental shelf, Surface waters, Air pollution effects, Seasonal, Transport, Advection, *Path of pollutants, Pollutant identification.

Water samples were collected from the southeastern Atlantic Continental Shelf surface waters in order to determine their mercury concentrations and to identify the processes responsible for the observed variations. Samples were collected during different seasons in order to evaluate the relative importance of such transfer mechanisms as atmospheric transport, river runoff, and horizontal advection. The mercury content varied seasonally, apparently in response to wind conditions. When the winds were predominantly westerly, the concentrations were higher in the surface waters than after periods of easterly winds. These relationships suggested two possible processes: first, exchange with offshore waters and secondly, atmospheric transport. The annual input of mercury from rivers was insufficient to explain the seasonal variations in mercury, even though river discharge volumes also vary seasonally; also no clearly discernible concentration gradients existed near shore. Exchange of mercury with open ocean waters is a less likely cause of observed variations. It is concluded that variations in the mercury concentration of continental shelf waters are due to seasonal variations in atmospheric mercury input from continental U.S. and would presumably occur in pulses. (Buchanan-Davidson--Wisconsin).
W76-09224

THE REPLICATION OF BIOLOGICAL EVENTS IN ENCLOSED WATER COLUMNS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W76-09226

POLLUTION FROM NON-POINT SOURCES,
Environmental Protection Agency, Seattle, Wash. Region X.
W. D. Clothier.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p. 23-31. 1 tab.

Descriptors: *Legislation, *Water pollution sources, *Water quality standards, Pacific Northwest U.S., Land use, Washington, Oregon, Water quality control, Water pollution control, State governments, Management, Pollution abatement, Federal Water Pollution Control Act.
Identifiers: Nonpoint sources.

The difficulties in controlling nonpoint water pollution sources and in designing appropriate federal and state legislation to abate nonpoint pollution, highlighted by the lumbering industry in Washington and Oregon, are reviewed. The Environmental Protection Agency's efforts to implement the Federal Water Pollution Control Act Amendments of 1972 emphasize the Best Management Practices designed to achieve water quality objectives but do not allow for adapting these practices on a local basis to the particular problems and environmental conditions. Washington's standard based on a 5 JTUs criteria indicates that it is impossible to operate logging operations without exceeding this limit, consequently there is no rational basis for managing water quality affected by lumbering activities. Congress recognized the problem in stating that nonpoint sources need to be controlled only 'to the extent feasible,' nevertheless water quality standards are absolute under the FWPCA and there does not seem to be any exception in the Act concerning standards compliance for nonpoint sources. The dichotomy in the Act with respect to nonpoint pollution sources and water quality standards should be eliminated. Water quality standards should be set that consider uses to be made of related land resources as well as the uses of the water itself. (See also W76-09230) (Auen-Wisconsin).
W76-09232

A FINITE ELEMENT MODEL OF CONTAMINANT MOVEMENT IN GROUNDWATER,
Chile Univ., Santiago, Centro de Recursos Hidraulicos.
G. Cabrera, and M. A. Marino.
Water Resources Bulletin, Vol. 12, No. 2, p 317-335, April 1976. 9 fig, 17 ref.

Descriptors: *Model studies, Wastes, *Groundwater movement, Mathematical models, Computer models, *Finite element analysis, Pollutants, *Path of pollutants, Groundwater, Aquifers, Streams, Recharge, Groundwater recharge, Infiltration, Flow, Surface-groundwater relationships, Subsurface flow, Subsurface waters.
Identifiers: Stream-aquifer systems.

Transient, two-dimensional solutions were developed which describe the movement and distribution of a conservative substance in a stream-aquifer system. The solutions were obtained by solving sequentially the groundwater flow and mass transport equations. A variational approach in conjunction with the finite element method was used to solve the groundwater flow equation. Galerkin's approach coupled with the finite element method was used to solve the mass transport equation. Linear approximated triangular elements and a centered scheme of numerical integration were employed to calculate the hydraulic head distribution and the concentration of solute in the flow region. The linear approximation used to define the concentration function within each element is not appropriate for cases involving steep concentration gradients. For such cases, higher order approximations are necessary to assure the continuity of gradients across interelemental boundaries. Numerical examples that illustrate the applicability of the model were presented. (Sims - ISWS)
W76-09253

SUBSURFACE BRINE DISPOSAL - BE REASONABLE,
Engineering Enterprises, Inc., Norman, Okla.
J. S. Fryberger.
Ground Water, Vol. 14, No. 3, p 150-156, May-June 1976. 5 fig, 11 ref.

Descriptors: *Brine disposal, *Groundwater, *Hydrogeology, *Oklahoma, Oil wells, Oil wastes, Injection wells, Brines, Waste disposal, Wastes, Pollutants, Aquifers, Piezometry, Potentiometric level, Geology, Legal aspects, Oil industry, Agriculture, Irrigation.
Identifiers: *Texas County(Okla).

A classic battle between landowners desiring to protect their fresh groundwater from pollution and oil companies needing a disposal zone for injection of oilfield brines developed in Texas County, Oklahoma. Initial studies showed that the disposal zone (Glorieta Formation) was in places only 500 feet below the bottom of the fresh-water aquifer (Ogallala Formation). Solution/collapse features in the intervening formations plus numerous poorly plugged wells and exploration holes provided potential avenues of brine migration. The potential for pollution appeared very real. The landowners not only wanted to halt construction of new brine disposal wells, but also wanted all 33 existing disposal wells abandoned and plugged. Tempers flared and intermittent litigation continued for over two years. A more complete hydrogeologic

analysis led to the following observations: (1) the potentiometric surface in the Glorieta is 100 to 400 feet below the water table in the Ogallala in areas where brine disposal is taking place; and (2) the transmissivities of the Glorieta and disposal rates are such that even pressure gradients around disposal wells are below the water level in the Ogallala. These hydrologic facts led to the conclusion that, even with a perfectly open conduit connecting the two formations, migration of disposal brine from the Glorieta into the fresh-water Ogallala would be impossible in the critical area because of pressure relationships. (Sims-ISWS)
W76-09261

TEMPERATURE, OXYGEN, AND NUTRIENT DISTRIBUTION PATTERNS IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 485-511, March 1976. 19 fig, 1 tab, 21 ref.

Descriptors: Chemical properties, Physical properties, *Lake Erie, *Temperature, *Dissolved oxygen, *Great Lakes, *Nutrients, Analytical techniques, Water temperature, Oxygen, Eutrophication, Nitrates, Phosphates, Lakes, Chemical analysis, Turbidity, Water properties, Silica, Surface waters, *Distribution patterns, Hydrogen ion concentration, Chlorides, Sulfates.
Identifiers: Soluble phosphorus, Particulate phosphorus, Organic detritus.

Ten major surveys of biological and chemical variables in Lake Erie were carried out during the 1970 shipping season. The observed distributions of temperature, turbidity, oxygen, soluble and particulate phosphorus, nitrate plus nitrite, ammonia, and soluble reactive silica were presented. Comment on the probable causes of the observed distribution patterns has been included where appropriate. Ammonia quantities in the lake remained almost unchanged throughout the year while nitrate plus nitrite quantities varied considerably. The ratio of particulate to total phosphorus showed very little seasonal change. (Henley-ISWS)
W76-09262

HEAVY METALS IN THE AQUATIC ENVIRONMENT.
Pergamon Press Ltd. Oxford/New York/Toronto/Sydney/Braunschweig, c1975, 352 p. P. A. Krenkel (editor).

Descriptors: *Heavy metals, *Aquatic environment, *Water pollution sources, *Water analysis, Pollutants, Toxicity, Analysis, Pollutants, Toxicity, Analyticaltechniques, Distribution patterns, Wate water treatment, Waste treatment, Legislation, Water quality standards, Monitoring, Pollutant identificationWater purification, Water pollution control, Water pollution treatment, Pollution abatement, Water pollution.

This volume contains the proceedings of an international conference held in Nashville, Tennessee, December 4-7, 1975, which was cosponsored by the International Association of Water Pollution Research, the Sport Fishing Institute, the American Fishing Tackle Manufacturers Association, and the Department of Environmental and Water Resources Engineering at Vanderbilt University. The volume is organized into 6 parts dealing, respectively, with toxicology of and physiological response to heavy metals, analytical techniques for quantitative determination of heavy metals, transport mechanisms of heavy metals in the environment (2 sessions), distribution of heavy metals in the environment, source reduction methodology, corrective measures for restoring metal-contaminated waters, and legislation, standards, surveillance, and monitoring of heavy metals in the environment. Subject and author indexes are appended. (Witt-IPC)
W76-09272

OVERSNOW RUNOFF EVENTS AFFECT STREAMFLOW AND WATER QUALITY,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 2C.
W76-09274

WOOD PRESERVATIVES: THEIR DEPLETION AS FUNGICIDES AND FATE IN THE ENVIRONMENT,
Canadian Forest Service, Ottawa (Ontario). Eastern Forest Products Lab.
D. W. Stranks.
Canadian Forestry Service, Eastern Forest Products Laboratory (Ottawa), Technical Report 10, 38 p, 1976. 2 fig, 157 ref.

Descriptors: *Wood preservatives(Pesticides), *Biodegradation, *Pesticide residues, Creosote, Chlorinated hydrocarbon pesticides, Inorganic pesticides, Aromatic compounds, Aliphatic pesticides, Microbial degradation, Water pollution sources, *Reviews, *Bibliographies, Pollutants.
Identifiers: Photodegradation.

This is a literature review of the fate of wood preservatives in the environment. Biological and other factors affecting the permanence, depletion, and breakdown of creosote, chlorinated organic toxicants, and inorganic salt preservatives are discussed. Outlines of the basic mechanisms by which microorganisms break down aliphatic, aromatic, and inorganic moleculesare included, and brief reference is made to photodegradation of toxicants. Possible directions for the future development of preservatives that have little if any potential to damage the environment are also indicated. Environmental problems from wood preservative usage are not expected in the immediate future apart from those possibly created by the release of effluents from treating plants. (Witt-IPC)
W76-09275

MECHANISM OF CONVERSION OF LIGNIN AND ITS DERIVATIVES IN NATURAL WATERS (MEKHANIZM PREVRASHCHENIYA LIGNINA I EGO PROIZVODNYKH V PRIRODNOJ VODE),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
V. A. Kriul'kov, V. T. Kaplin, and G. I. Ganin.
Khimiya i Ispol'zovanie Lignina (Chemistry and Utilization of Lignin), Riga, 1974, p 397-408. 9 fig, 8 ref, 1 tab.

Descriptors: *Lignins, Natural streams, *Biodegradation, *Pulp wastes, Water pollution sources, Wastes, Industrial wastes, Dissolved oxygen, Benthos, Laboratory tests, Oxidation, Ultraviolet radiation, Aerobic conditions, Anaerobic conditions, Water pollution, Wood wastes, Phenols, *Waste assimilative capacity.
Identifiers: Alkali lignin, Thiolignin, Kraft mills.

The conversions of lignin in natural waters were studied in laboratory model experiments on kraft lignin and soluble thiolignin, in the presence and absence of bottom sediments. The complex character of biochemical conversions during lignin degradation was indicated by changes of the concentration of dissolved oxygen, and a more rapid degradation in the presence of bottom sediment microorganisms was evidence by a higher oxygen deficiency in the presence of the sediments. In the first stage of degradation, water-soluble compounds are formed, apparently through splitting of soluble fragments from the lignin molecules, probably by rupture of ether bonds. Further degradation of this soluble fraction is analogous to the degradation of soluble thiolignin, and results in the formation of mono- and dihydroxybenzenes and carboxylic acids. The splitting from the soluble lignin of side chains begins after about 7 days, and is terminated after 28-32 days, when dimeric structures are decomposed into polyhydric phenols. A scheme of lignin decomposition in natural waters is presented, in which quinones, formed through oxidation of polyhydrric phenols, are either condensed to humic acids or are converted to carboxylic acid through opening of the quinone ring. A study was made of the effect of UV radiation on the rate and the mechanism of lignin degradation using soluble thiolignin under anaerobic, aerobic, and aeration conditions. Phenolic compounds, carboxylic acids, and methanol were the photolytic degradation products. A mechanism of lignin photodegradation is proposed involving the intermediate formation of oxonium complexes. (Stapinski-IPC)
W76-09280

PHENOLS -- PRODUCTS OF LIGNIN DEGRADATION -- IN EFFLUENTS OF THE BAIKAL PULP AND PAPER MILL (FENOLI -- PRODUKTY RAZRUSHENIYA LIGNINA -- V STOCHNYKH VODAKH BAIKAL'-SKOGO TSELLYULOZNOGO ZAVODA),
Leningradskaya Lestekhicheskaya Akademiya (USSR).
For primary bibliographic entry see Field 5A.
W76-09281

PHYTOPLANKTON DISTRIBUTION IN THE VICINITY OF THE PERU CURRENT NEAR 8 DEGREES S. LATITUDE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
T. N. Rat'kova.
Okeanologiya. 14(6); p 1077-1081, 1974.

Descriptors: *Phytoplankton, *Distribution patterns, Algae, South America, Cytological studies, *Path of pollutants.
Identifiers: *Peru current, *Pycnocline.

The hydrological peculiarities of the Peru Current influence the distribution of phytoplankton. Maximum phytoplankton numbers are recorded in the near-shore Peru Current areas. Phytoplankton numbers decrease with increasing distance from shore. The minimum algal concentration is found in the Peru continental area. The vertical distribution of algae is uneven. Maximum phytoplankton numbers are found in the water layer above the pycnocline or in the pycnocline itself. At the stations within the upwelling zone, the peculiar average diameter of the cells increases under the pycnocline.--Copyright 1975, Biological Abstracts, Inc.
W76-09283

SEWAGE EFFLUENT INFILTRATES FROZEN FOREST SOIL,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
A. R. Harris.
U.S.D.A. Forest Service, Research Note NC-197, 2 p, 1976. 1 fig, 4 ref.

Descriptors: *Forest soils, *Sewage effluents, *Frozen soils, *Irrigation, Jack pine trees, Oak trees, Sewage disposal, Water pollution sources, Nitrogen compounds, Phosphorus compounds, Permeability, Soil disposal fields, Soil water, Pine trees.

Secondarily-treated sewage effluent, applied at the rate of 1 and 2 inches per week, infiltrated a frozen Sparta sand soil forested with jack pine (Pinus banksiana) and scrub oak. Maximum frost depth averaged 60 cm in treated plots and 35 cm in control plots. Nitrogen was mobile, with some accumulation. Phosphorus was absorbed. (Witt-IPC)
W76-09288

MINERAL RESOURCE MANAGEMENT OF THE OUTER CONTINENTAL SHELF.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6G.
W76-09306

REPORT ON THE HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE SPOIL DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5E.
W76-09309

WIND AND CURRENT EFFECTS ON LARGE-SCALE OIL SLICKS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5G.
W76-09310

PROCEEDINGS OF JOINT CONFERENCE ON PREVENTION AND CONTROL OF OIL SPILLS, MARCH 13-15, 1973, WASHINGTON, D.C.,
American Petroleum Inst., Washington, D. C.
Prevention and Control of Oil Spills, Proceedings of Conference held at Washington, D. C., March 13-15, 1973. Sponsored by American Petroleum Institute, Environmental Protection Agency and United States Coast Guard. 840 p. fig, ref.

Descriptors: *Continental Shelf, *Environmental effects, *Water resources, *Resources development, *Oil spills, *Oil pollution, *Water pollution effects, *Water pollution sources, *Pollution identification, *Water quality control, Offshore structures.
Identifiers: *Outer Continental Shelf, Offshore technology, Biological effects, Water pollution prevention.

This collection of 85 papers constitute the Proceedings of the Joint Conference on Prevention and Control of Oil Spills held March 13-15, 1973, in Washington, D. C. sponsored by the American Petroleum Institute, Environmental Protection Agency and the United States Coast Guard. The papers are grouped by subjects presented at the six sessions: Prevention; Detection and Monitoring of Spills; Identification of Oil; Control Technology - R and D; Fate of Oil; Applied Control Technology; and Biological Effects. Only papers dealing with environmental effects on water resources have been abstracted and will be found distributed separately within the SWRA series. (See also W76-09313 thru W76-09328) (Sinha-OEIS)
W76-09312

AN ANALYSIS OF OIL OUTFLOWS DUE TO TANKER ACCIDENTS,
Coast Guard, Washington, D. C.
V. F. Keith, and J. D. Porricelli.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D. C., March 13-15, 1973, p 3-14, 2 fig, 14 tab, 8 ref, 1 illust.

Descriptors: *Continental shelf, *Oil pollution, *Environmental effects, *Water pollution sources, *Oil spills, Explosions, Accidents, Water quality, Transportation, Fossil fuels.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Tankers, Groundings, Collisions, Casualties.

This study shows the following important points: Accidental oil outflows from tankers is on the order of 215,000 long tons or 218,440 metric tons per year; structural failures, groundings, and explosions involving the total loss of tankers have a distinct effect upon any analysis conducted. In this respect, tanker survivability must be considered; groundings exceed collisions in terms of outflows by a factor of 4 to 1. This would tend to put an extreme accent on the need for bottom protection over side protection; explosions on large tankers especially, and on all tankers in general, deserve some immediate reaction; certain flags of registry appear to need an upgrading in their standards and maintenance requirements; and there is not clear indication that tanker size has any relationship to casualty frequency and oil outflow other than in the case of explosions. (See also W76-09312) (Sinha-OEIS)
W76-09313

OCCURRENCE, CAUSE AND AVOIDANCE OF THE SPILLING OF OIL BY TANKERS,
International Tanker Owners Pollution Federation Ltd., London (England).
J. W. Smith.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D. C., March 13-15, 1973. p 15-20, 10 tab, 6 ref.

Descriptors: *Continental Shelf, *Oil spills, *Oil pollution, *Water pollution sources, *Environmental effects, Navigation, Accidents, Fossil fuels.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Collisions, *Tankers, Groundings, Strandings, Casualties.

Analysis of the data presented suggests that the majority of oil spills occur at, or very close to, the oil terminal, usually while the tanker is actually transferring cargo or bunker fuel. No one operation is particularly prone to result in an accidental spill. The most common cause for an oil spill is that the tanks overflow, either because, on loading, the tank was overfilled, or on discharging, because residue from a discharge tank was being pumped into a slop tank which was already full. The number of spills resulting from equipment failure is relatively small. Size of the tanker appears to be unrelated to number of accidents. Major spills are shown to be due to strandings, or collision in areas of high traffic density and low visibility. (See also W76-09312) (Sinha-OEIS)
W76-09314

MICROBIAL ECOLOGY OF PETROLEUM UTILIZATION IN CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W76-09319

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 11-12, 1975, SAVANNAH, GEORGIA.
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
For primary bibliographic entry see Field 5G.
W76-09329

THE OCS FORGOTTEN LAND: TERRITORIAL SEA, NEARSHORE, AND ESTUARY,
Florida Dept. of Administration, Tallahassee. Div. of State Planning.
For primary bibliographic entry see Field 5G.
W76-09330

THE ROLE OF ENGINEERING IN MINIMIZING OFFSHORE IMPACTS,
Duke Univ., Durham, N. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-09331

OFFSHORE PETROLEUM DRILLING AND PRODUCTION,
Exxon Co., New Orleans, La. Southeastern Div.
For primary bibliographic entry see Field 5G.
W76-09332

INTACT MANURE PACK HALTS SEEPAGE,
For primary bibliographic entry see Field 5G.
W76-09344

COUNTERMEASURES TO CONTROL OIL SPILLS IN WESTERN CANADA,
EBA Engineering Consultants Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5G.
W76-09346

APPLICATION OF GROUND-WATER FLOW THEORY TO A SUBSURFACE OIL SPILL,
Geological Survey, Menlo Park, Calif. Engineering Geology Branch.
For primary bibliographic entry see Field 2L.
W76-09350

CATHODIC PROTECTION WELLS AND GROUND WATER POLLUTION,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W76-09357

THERMAL STRUCTURE OF LAKE MASCARDI (PROVINCE OF RIO NEGRO, ARGENTINA, (IN SPANISH),
Instituto National de Limnologia, Santo Tome (Argentina).
For primary bibliographic entry see Field 2H.
W76-09358

MAKING THE WORLD SAFE FOR GROUND WATER,
A. B. Stanley.
Water Well Journal, Vol. 30, No. 4, p. 34-36, April, 1976.

Descriptors: *Research facilities, *Water pollution, *Groundwater, Biodegradation, Liquid wastes, Research equipment.
Identifiers: *Groundwater pollution research.

Ground water pollution research is currently being done by the Ground Water Branch of the Robert S. Kerr Environmental Research Laboratory in Ada, Oklahoma. The Kerr Laboratory is a part of the Environmental Protection Agency's research and development center network. The Kerr Center responds to specific research problems on a regional or local level. The major research emphasis is on the fate of pollutants in ground water; the biodegradation, degradation products, and the effects on the ground water system of these pollutants and their by-products. The center uses a mass spectrometer for trace element identification and is in the process of developing a ground water sampling unit which will provide contamination-free samples. (Heiss-NWWA)
W76-09360

INTERACTION BETWEEN SURFACTANT AND DYE IV. APPLICATION OF THE ACRIDINE ORANGE METHOD TO THE SURVEY OF POLLUTION OF ALKYLBENZENE SULFONATE IN RIVERS AND THE SURVEY OF WATER POLLUTION IN KINOKAWA,
Wakayama Prefectural Inst. of Public Health (Japan).
For primary bibliographic entry see Field 5A.
W76-09364

EFFECTS OF SELECTED HERBICIDES ON BACTERIAL POPULATIONS IN NONTREATED AND TREATED WATER,
Clemson Univ., S. C. Dept. of Biochemistry; and Clemson Univ., S. C. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W76-09369

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME II.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09371

INDUSTRY CANDIDATES AND GENERAL LOCATIONS FOR ARTIFICIAL INDUSTRIAL-PORT ISLANDS,
Texas A and M. Univ., College Station.
For primary bibliographic entry see Field 5G.
W76-09377

MASS TRANSPORT AND DISPERSION OFF A TIDAL INLET,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W76-09381

THE OFFSHORE ECOLOGY INVESTIGATION,
Gulf Universities Research Consortium, Gulfport, Miss.
For primary bibliographic entry see Field 5G.
W76-09382

HYDROCARBONS IN WATER AND SEDIMENT SAMPLES FROM COAL OIL POINT AREA, OFFSHORE CALIFORNIA,
Exxon Production Research Co., Linden, N.J.
C. B. Koons, and D. E. Brandon.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2387. p 513-521, 3 fig, 3 tab. 8 ref.

Descriptors: *Seepage, *Oil pollution, Resources development, Water pollution sources, *Environmental effects, *California, Continental Shelf, Organic compounds.
Identifiers: *Outer Continental Shelf, Natural seepage, *Coal Oil Point(CA), Environmental impact.

Water samples collected within about a 1-sq nautical mile area of the Coal Oil Point submarine oil seeps contain somewhat higher amounts of dissolved hydrocarbons, both heavy (C15+) and light (C3-C8), than do water samples collected 10-15 miles to the ESE in the offshore Pt. Dume area. However, the difference in concentrations is much more pronounced for the dissolved heavy hydrocarbons than for the lighter ones. The heavy hydrocarbon concentrations found in these offshore California water samples ranged from 0.2 to 16 ppb and agreed closely with concentrations in Atlantic and Gulf of Mexico waters. Bottom sediments collected close to the submarine seeps contain on the average about 25 times more heavy hydrocarbons than do sediments collected in areas well away from the seeps. Chromatographic analyses of the hydrocarbons extracted from the sediments clearly distinguish those hydrocarbons introduced into the sediments by the oil seeps from those introduced by natural biologic and chemical processes. The hydrocarbons in the sediments around Coal Oil Point are mainly derived from the seepage. In conclusion, the active seepage at Coal Oil Point does not appear to be building up hydrocarbon concentrations in the waters and sediments or changing the type of hydrocarbons except very close to the seeps. Hydrocarbons from the seeps are not moving over a wide area and being incorporated in the sediments or the water column. They should have little environmental impact. (See also W76-09374) (Sinha - OEIS)
W76-09384

INFLUX OF PETROLEUM HYDROCARBONS INTO THE OCEAN,
Coast Guard, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-09385

EVALUATION OF OFFSHORE BREAKWATER STABILITY UNDER WAVE ACTION,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09387

PHOTOOXIDATION AS A FACTOR IN THE ENVIRONMENTAL DISPERSAL OF CURDE OIL,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Exploration and Production Research Div.
R. Burwood, and G. C. Speers.
Estuarine Coastal Mar Sci. 2(2): 117-135. 1974.

Descriptors: *Path of pollutants, *Dispersion, *Oil wastes, Biodegradation, Water pollution sources, Environmental effects.
Identifiers: Carbon, Crude, Dispersal, Dissolution, Environmental, Factor, Hydro, Laboratory, Marine, Oil, Oxidation, Oxides, Photo, Pollution, Processes, Simulation, Thiacyclane, Weathering, *Photooxidation, *Crude oil.

Processes relating to the dispersion and subsequent fate of crude oil in the marine environment are briefly reviewed. An important, but little studied, aspect of the dispersal and degradation of crude oil involves weathering processes effecting chemical transformations which assist the dissolution of petroleum components. Conditions experienced by crude oil in the marine environment include abundantly oxygenated surface waters, often accompanied by intense photo-illumination, suggesting that oxidative processes are operative. Laboratory simulation of the solubilization of crude oils in sea water confirmed previous observations on the rapid selective dissolution of the light aromatic hydrocarbons and provided evidence for the occurrence of a particular oxidation process. Prolonged equilibration of a medium sulfur content (2% wt) Middle East crude oil with sea water was accompanied by a conspicuous increase in the complex envelope of higher boiling soluble components in the aqueous phase. After 4 wk, this envelope constituted about 75% of the water-soluble fraction, and characterization of its components by chemical and combined g.c.-m.s. (gas chromatography-mass spectroscopy) techniques showed that they consisted almost exclusively of a complex mixture of thiacyclane-I-oxides. The complex mixture was previously reported as polar aromatic material, but is now shown to be oxidation products derived from indigenous crude oil thiacyclanes. A possible scheme for the oxidative conversion of the latter compounds to their I-oxides is outlined and the relevance of this mechanism to the partial dispersal of the sulfur content of crudes is considered.--Copyright 1975, Biological Abstracts, Inc.
W76-09389

DISTRIBUTION, CIRCULATION AND EVOLUTION OF NUTRIENTS, PARTICULARLY INORGANIC PHOSPHORUS IN LAKE ETANG DEBERRE: INFLUENCE OF RIVER DURANCE WATERS, (IN FRENCH),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Oceanographie.
M. Minas.
Int Rev Gesamten Hydrobiol. 59(4); p 509-542, 1974.

Descriptors: *Distribution, *Nutrients, *Phosphorus, Photosynthesis, Lakes, Salinity, Brackish water, Nitrogen, Path of pollutants, Circulation.
Identifiers: Anoxic conditions, Marseilles, *Brackish lakes, France, River Durance(France), *Lake Etang de Berre(France).

The Etang de Berre is a brackish lake near Marseille (France). It was studies between 1965 and 1969, during which period a new hydroelectric plant caused the River Durance to be diverted into it. After the River Durance was diverted into the lake the total amount of inorganic P and N entering the lake was increased. Dilution caused a change of salinity from 30-34 ppt,to 2-25 ppt, but there remained a permanent halocile in the deepest part of lake, near the outlet to the Mediterranean Sea. Below the pycnocline the water became anoxic and this deep water acted as nutrient tapl becaaue of its isolation from the photsynthetic zone.--Copyright 1975, Biological Abstracts, Inc.
W76-09393

DEGRADATION OF BUNKER C OIL UNDER DIFFERENT COASTAL ENVIRONMENTS OF CHEDABUCTO BAY, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia)
M. A. Rashid.
Estuarine Coastal Mar Sci. 2(2); p 137-144, 1974.

Descriptors: *Biodegradation, *Oil spills, *Canada, *Oil pollution, Environment, Bacteria, Beaches, Coasts, Bays, Oxidation, Aromatic compounds.
Identifiers: *Bunker oil, C, *Chedabucto Bay(NC).

The extent of degradation of spilled oil in marine areas depends, in a large measure, upon the environmental conditions of coastal areas. The degradation is rapid in the high energy environment but is relatively slow in protected areas. Bacterial as well as oxidative processes alter the composition of oil. Oils exposed to high energy shoreline environments lose n-alkanes more rapidly. This loss is probably due to bacterial degradation because no other known physical or chemical process can account for this. With weathering the saturated and aromatic hydrocarbons decrease with a corresponding increase in the non-hydrocarbons, particularly in resins and NSO compounds. These changes which are possibly due to microbial and oxidative degradation processes are prominent in the oils of high energy environment. The rates of degradation of saturated and aromatic fractions are the same. The specific gravity increases with an increase in degradation of oil. The viscosity values show a marked increase with weathering. The increased viscosity of the oil residues in the high energy environment reduces its mobility. The residual oils present in varying amounts on nearly all contaminated beaches (Canada) of the protected areas of low and moderate energy environments will probably persist for several years. In high energy environments the residual oils are substantially altered due to the loss of n-alkanes and a parallel increase in resins and NSO compounds. The resulting residues are highly viscous and remain adhering to sand and pebble substrate.--Copyright 1975, Biological Abstracts, Inc.
W76-09394

5C. Effects Of Pollution

BIODEGRADATION OF POLYNUCLEAR AROMATIC HYDROCARBON POLLUTANTS BY SOIL AND WATER MICROORGANISMS,
Illinois Univ. at Urbana-Champaign. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-08752

THE EFFECTS OF INCREASING SALINITY ON THE PYRAMID LAKE FISHERY,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev.
R. Taylor.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 795, $3.50 in paper copy, $2.25 in microfiche. Nevada Water Resources Center, Desert Research Institute, Reno, Completion Report, May 1976. 9 p, 4 tab, 8 ref. OWRT A-040-NEV(2) 14-31-0001-3228.

Descriptors: Fish physiology, Saline lakes, *Nevada, *Salinity, Alkaline water, Lakes, Diversion, *Trout, Ions, Dissolved solids.
Identifiers: *Pyramid Lake(Nev), Alkaline lakes, Lahontan cutthroat trout, *Water diversion effects(Fish).

Pyramid Lake is a large terminal lake in Nevada. Since 1910 the lake has been receding because of water diversions from the Truckee River which is the only perennial stream entering the lake. Consequently, the waters of Pyramid Lake are becoming more saline and alkaline producing a threat to the fishes present. Tests were conducted on various trout species to determine the effects of increased ion concentrations on the fish. Results showed Lahontan Cutthroat trout (Salmo clarki henshawi) were the most adaptable species to these increased ionic conditions. However, in order for even the Lahontan Cutthroat to survive in Pyramid Lake the dissolved solids level should never exceed 12,500 ppm (parts per million) at which time the elevation of the lake would be approximately 1115 metre above mean sea level. (Fallon-Nevada)
W76-08753

THE EFFECTS OF WASTE WATER DIVERSION ON HEAVY METAL LEVELS IN THE SEDIMENTS OF A LARGE URBAN LAKE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-08754

MERCURY CONCENTRATIONS IN SPRING AND FALL ZOOPLANKTON OF THE ESTUARY OF THE AROSA RIVER, (IN SPANISH),
Instituto Espanol de Oceanografia, Madrid (Spain). Central Laboratories.
J. Corral, and C. Masso.
Bol Inst Esp Oceanogr. 184, p 1-16, 1975.

Descriptors: *Mercury, *Estuaries, Seasonal, Europe, *Zooplankton, Rivers.
Identifiers: *Spain(Arosa River estuary).

Hg concentrations (on a dry weight basis) in plankton taken in the Arosa River (Spain) in May, June and Sept.-Oct., 1974 are given. Among the values found, 30 ranged from 0.5-2.78 ppm and 3 other concentrations were: 12.03, 14.63 and 16.80 ppm.--Copyright 1975, Biological Abstracts, Inc.
W76-08768

UPTAKE AND EFFECT OF CADMIUM ON ZEBRAFISH,
Marist Coll., Poughkeepsie, N. Y. Environmental Science Program.
R. Rehwoldt, and D. Karimian-Teherani.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 4, p 442-446, 1976. 1 fig, 2 tab, 11 ref.

Descriptors: *Cadmium, *Bioassay, *Heavy Metals, *Water Pollution Effects, Environmental effects, *Laboratory tests, *Absorption, *Reproduction, Fish reproduction, Fish eggs, Analytical techniques, Methodology.
Identifiers: *Zebrafish, Brachydanio sp., Sublethal effects.

Mature zebrafish (Brachydanio rerio) were maintained in the laboratory and fed 10 ppm cadmium mixed with the regular fish food. Fish were bred weekly and the eggs allowed to hatch. A control group of zebrafish was maintained without cadmium added to the diet. The accumulation curve for cadmium showed a steep rise followed by slower uptake and finally a plateau. Female zebrafish reached a peak concentration of cadmium a 12.7 micrograms/gram dry weight and males peaked at 5.1 micrograms/gram dry weight. The monthly total of eggs began to decline after the first month and there was a highly significant decrease in the number of zebrafish offspring after chronic long-term ingestion of cadmium. Analysis of offspring showed no detectable amounts of cadmium. (Katz)
W76-08772

THE EFFECT OF DURSBAN UPON FRESH WATER PHYTOPLANKTON,
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
J. R. Brown, L. Y. Chow, and C. B. Deng.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 4, p. 437-441, 1976. 2 fig., 2 tab., 4 ref.

Descriptors: *Growth rates, *Phytoplankton, *Pesticides, *Environmental effects, *Organophosphorous pesticides, *Inhibitors, *Diatoms, Primary productivity, Pesticide residues, Plant growth, Aquatic algae, Lakes, On-site investigations, Analytical techniques, Plant populations, Plankton, Aquatic plants, Ponds, Canada.
Identifiers: *Dursban, Sublethal effects, Ceratium sp.

Test cylinders were constructed in a fresh water lake with known phytoplankton populations to test the effect of small amounts of Dursban, an organophosphorous pesticide, on fresh water phytoplankton and diatoms. The lowest test concentration of Dursban, 1.2 ppb, decreased the population of all phytoplankton observed except for Ceratium sp., which were unaffected at 240 ppb Dursban. The concentration of Dursban declined rapidly within the test cylinders, but the effect upon phytoplankton remained apparent after seventeen days. Growth inhibition of phytoplankton was most pronounced during their active growth phase. (Katz)
W76-08773

THE EFFECT OF FERTILIZATION ON THE SPECIES COMPOSITION OF SALT MARSH DIATOMS,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
C. D. Van Raalte, I. Valiela, and J. M. Teal.
Water Research, Vol. 10, p 1-4, 1976, 2 fig, 2 tab, 24 ref.

Descriptors: *Fertilization, *Diatoms, Plant groupings, *Marsh plants, *Sewage sludge, *Sludge disposal, *Salt marshes, Coastal marshes, Tidal marshes, *Ureas, Microorganisms, Halophytes, Inhibitors, Nitrogen compounds, Massachusetts, *Marshes, Water pollution effects.
Identifiers: *Epibenthic algae, Navicula salinarum, Great Sippewisset Salt Marsh, Cape Cod.

The diversity of epibenthic diatoms in a salt marsh was reduced by fertilization with either sewage sludge or urea. Counts of 500 individuals were sufficient to demonstrate a lower total number of species, a smaller number of rare species and a greater dominance of the most abundant species in the fertilized areas as compared with the controls. Navicula salinarum Grun., which formed 5-9% of the diatoms in the controls became dominant in the fertilized plots, comprising 20-25% of the population. (Katz)
W76-08774

THE ROLE OF PH ON THE ACUTE TOXICITY OF SULFITE IN WATER,
Government Industrial Research Inst., Osaka (Japan).
H. Sano.
Water Research, Vol. 10, p 139-142, 1976, 6 fig., 1 tab., 11 ref.

Descriptors: Methodology, *Bioassay, *Hydrogen ion concentration, Fish, *Toxicity, *Correlation analysis, *Chemical wastes, *Sulfur compounds, *Laboratory animals, Water pollution effects, Laboratory tests.
Identifiers: *Sulfite, *Sulfur dioxide, Acute toxicity, Flue Gas, Gupppy, Lebistes reticulatus, Median Tolerance Limit(TLm).

The toxicity of sulfite to fish decreases with increasing pH value, because the HSO3(-) ion is more toxic than the S03(2-) ion. An effective sulfite concentration Seff which is proportional to the toxicity on fish, is expressed by the following equation: Seff = (HSO3(-) + f(SO3)(2-)) where f is a coefficient which expresses the change of toxicity of sulfite depending on the pH of the water, and varies for each species of fish. For goldfish, owing to the very small toxic contribution of SO3(2-) ion (f = 0.07), the pH dependence of the toxicity of sulfite on pH was so strong that sulfite seemed almost non-toxic in basic solution. However, f for guppy is somewhat larger (f = 0.20) so that the toxicity of sulfite weakly depends on the pH value of water. (Katz)
W76-08775

MERCURY CONTENT OF BIOTA IN COASTAL WATERS IN HAWAII,
Hawaii Univ., Honolulu. Pacific Biomedical Research Center.
H. W. Klemmer, C. S. Unninayer, and W. I. Okubo.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 4, p. 454-457, 1976. 2 tab., 8 ref.

Descriptors: *Mercury, Path of pollutants, *Absorption, *Trophic level, *Benthos, *Food chains, Analytical techniques, Carnivores, Food chains, Sampling, *Hawaii.
Identifiers: Bioaccumulation, Tissue analysis.

Biota collected from four coastal areas of Hawaii were analyzed for total mercury content and classified according to primary food material as herbivores, omnivores, primary benthic carnivores and secondary benthic carnivores. Of the 58 species collected, most were benthic in habitat. Mercury concentrations ranged from undetectable in 26% of the samples to a high of 1.0 ppm in one sample. The mean value was 0.08 ppm. Highly significant differences existed between values of mercury for different trophic levels with an increase in mean mercury value with each elevation in trophic level. This suggests successive biological concentration and transport of this element. (Katz)
W76-03776

CILIATE ASSOCIATIONS (CILIATA) IN THE PRADNIK STREAM, WHICH IS POLLUTED BY RESIDUAL WATERS OF A DAIRY, (IN FRENCH),
Jagellonian Univ., Krakow (Poland). Dept. of Hydrobiology.
A. Czapik.
Acta Hydrobiol. 17(1), p 21-34, 1975.

Descriptors: *Protozoa, *Farm wastes, Water pollution effects, Dairy industry, Europe, *Algae, Streams, Nutrients.
Identifiers: *Poland(Pradnik Stream).

The infusoria living on the bottom of Pradnik stream was examined. This stream crosses Ojcow National Park and falls into the River Vistula on the territory of Cracow (Poland). Samples were taken from shallow places close to the banks of the stream where mud settles and algae develop. In these places the infusoria formed mixed communities with a predominance of algophagocytic species over microphagocytic ones. The infusoria were classified into groups depending on mode of nutrition. The waste water from the dairy, brining a large amount of undecomposed organic matter, is a permanentdanger for the biological balance of this stream.-Copyright 1975, Biological Abstracts, Inc.
W76-08777

INSECTICIDE RESIDUES IN TWO TURTLE SPECIES FOLLOWING TREATMENT WITH DDT,

Middle Tennessee State Univ., Murfreesboro. Dept. of Biology.
P. J. Owen, and M. R. Wells.

Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 4, p. 406-411, 1976. 2 tab., 10 ref.

Descriptors: Path of pollutants, *DDT, *DDD, *DDE, *Bioassay, *Pesticide residues, *Food webs, *Turtles, Absorption, Pesticides, Aquatic animals, Reptiles, Laboratory tests, Chlorinated hydrocarbon pesticides, Animal physiology, *Insecticides, Pollutant identification.
Identifiers: Tissue analysis, *Chrysemys sp., Red-eared turtles, Mudland painted turtles, Bioaccumulation.

Red-eared and midland painted turtles (Chrysemys scripta and C. picta, respectively) were treated with 100 mg DDT/kg of body weight, administered orally. The test included one group receiving only one dose of DDT and another group receiving three doses at weekly intervals. Tissue analyses showed no pattern to the fate of DDT or its metabolites. The major organ of degradation was the liver, which contained DDT and its metabolites in both species 3, 6, and 12 hours after treatment. Residues detected in the brain before the 24 hours treatment period were probably residual, however, higher concentrations were detected after three week treatment. Large quantities of residues were detected in fat. Both species were able to metabolize DDT to its less toxic forms and could excrete all forms immediately. Based on this data, the concentrations of DDT previously used in the environment would not pose a health problem for turtles. (Katz)
W76-08778

GROWTH AND SURVIVAL OF YOUNG-OF-THE-YEAR EMERALD SHINERS (NOTROPIS ATHERINOIDES) AT DIFFERENT TEMPERATURES,

Environmental Research Lab., Duluth, Minn.
J. H. McCormick, and C. F. Kleiner.

Journal of the Fisheries Research Board of Canada, Vol. 33, p. 839-842, 1976.

Descriptors: *Growth rates, *Shiners, *Temperature, *Biomass, *Lethal limit, *Mortality, Forage fish, Aquaculture, *Heated water, Laboratory tests, Fish, Productivity, Food chains, Environmental effects.
Identifiers: Notropis atherinoides.

Young-of-the-year emerald shiners (Notropis atherinoides) were exposed to mean constant temperatures of 6.9, 11.9, 16.0, 19.8, 24.0, 26.9, 28.9, 31.0, 32.8, 34.9 and 36.7C for 6 weeks. Maximum rates of growth and net biomass gain occurred at 28.9C, but were not statistically greater than those at 26.9 and 24.0C. Death rates were low at test temperatures up to 32.8C but high at 34.9C and above. The incipient 7-day TL50 was estimated to be 35.2. The 1-day TL50 of fish taken from the natural habitat, where peak temperatures ranged from 20 to 25 C, was 32.6 C. Natural production of this important forage species would probably be best where temperatures are at least 19 C but not above 29 C for extended periods. (Katz)
W76-08779

A CONTINUOUS FLOW BIOASSAY METHOD TO EVALUATE THE EFFECTS OF OUTBOARD MOTOR EXHAUSTS AND SELECTED AROMATIC TOXICANTS ON FISH,

Illinois Univ. at the Medical Center, Chicago. School of Public Health.
G. Brenniman, R. Hartung, and W. J. Weber, Jr.

Water Research, Vol. 10, p. 165-169, 1976, 1 fig., 2 tab., 22 ref.

Descriptors: Methodology, *Bioassay, Analytical techniques, *Toxicity, *Water pollution source, Water pollution, *Laboratory tests, Laboratory animals, Fish environment, Water pollution effects.
Identifiers: *Goldfish, Continuous flow bioassay, Toluene, Xylene, 1,3,5 Trimethylbenzene, *Outboard Motor Exhaust(OME), LC-50, Carassius auratus, Static bioassay, Volatile toxicants, Leaded OME, Non-leaded OME.

A continuous flow bioassay system was designed to measure the effects of outboard motor exhaust (OME) emissions and selected volatile and evaporative aromatic toxicants on goldfish (Carassius auratus). Continuous flow bioassays were run for 24, 48, 72, 96, and 720 h to determine lethal concentrations for 50% of individuals (LC-50's) for leaded OME, non-leaded OME, and toluene, xylene, and 1,3,5 trimethylbenzene, the three individual compounds having been identified as significant aromatic components of OME. The 96 h LC-50's for these substances were 171, 168, 23, 17, and 13 ppm, respectively. The values of 171 and 168 ppm for the two OME's are given in terms of gallons of fuel burned per million gallons of water. The continuous flow bioassay method was demonstrated to be a more reliable indicator of the effects of OME pollutants on on aquatic organisms than is the static bioassay method. (Katz)
W76-08780

ACUTE AND CHRONIC TOXICITY OF LEAD TO RAINBOW TROUT SALMO GAIRDNERI, IN HARD AND SOFT WATER,

Fishery Research Centre, Fort Collins, Colo.
P. H. Davies, J. P. Goettl Jr., J. R. Sinley, and N. F. Smith.

Water Research, Vol. 10, p. 199-206, 1976, 4 fig, 4 tab, 26 ref.

Descriptors: Methodology, *Bioassay, *Analytical techniques, *Toxicity, *Rainbow trout, *Lead, *Chemical analysis, *Larvae, *Fish eggs, Pathology, Water pollution effects, Laboratory tests, Fish environment, Heavy metals, Water chemistry, *Rainbow trout.
Identifiers: Hard water, Soft water, Static bioassay, LC50, Dissolved lead, Total lead, Maximum Accepted Toxicant Concentrations(MATC), Acute bioassay, Continuous flow bioassay.

Lead was highly toxic to rainbow trout in both hard water (hardness 353 mg 1-1 as CaCO3) and soft water (hardness 28 mg 1-1). Analytical results differ greatly with methods of analysis when measuring concentrations of lead in the two types of water. Two static bioassays in hard water gave 96-h LC50's of 1.32 and 1.47 mg 1-1 dissolved lead vs total lead LC50's of 542 and 471 mg 1-1, respectively. In a flow-through bioassay in soft water a 96-h LC50 of 1.17 mg 1-1, expressed as either dissolved or total lead, was obtained. From chronic bioassays, MATC's of lead for rainbow trout in hard water were between 18.2 and 31.7 ug 1-1 dissolved lead vs 120-360 ug 1-1 total lead. In soft water, where exposure to lead was initiated at the eyed egg stage of development, the MATC was between 4.1 and 7.6 ug 1-1. With exposure to lead beginning after hatching and swim-up of fry, the MATC was between 7.2 and 14.6 ug 1-1. Therefore, fish were more sensitive to the effects of lead when exposed as eggs. (Katz)
W76-08781

RIVER POLLUTION BY ANTICHOLINESTERASE AGENTS,

Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
D. L. Coppage, and T. E. Braidech.

Water Research, Vol. 10, p. 19-24, 1976, 1 fig., 5 tab., 31 ref.

Descriptors: *Toxicity, Freshwater fish, *Industrial wastes, *Fish physiology, Animal pathology, *Path of pollutants, *Agricultural chemicals, *Pesticide toxicity, *Carbamate pesticides, *Organophosphorous pesticides, Chemical analysis, *Bioassays, *Carp, On-the-site investigations, Water pollution, *Missouri River, Missouri.
Identifiers: Blue River(Missouri), Kansas City(Missouri), Acetylcholinesterase(AChE), Brain-AChE.

The effects of effluent discharged into the Blue River, near its confluence with the Missouri River in Kansas City, Missouri, by a manufacturer of organophosphate and carbamate pesticides were investigated. Since these pesticides act as nerve poisons by inhibiting the neurotransmitter modulating enzyme acetylcholinesterase (AChE) in the nervous system, poisoning of fishes was diagnosed by measurement of brain-AChE in fishes collected from the Missouri River upstream and downstream from the mouth of the Blue River. Other fish were exposed to diluted effluent in glass jars and their brain-AChE measured to determine combined poisoning potential of compounds present. Fishes immediately downstream repeatedly had lower brain-AChE activity than fishes upstream, and fish exposed to diluted effluent had lower brain-AChE activity than unexposed fish. Chemical analyses showed substantial amounts of AChE-inhibiting pesticides in the effluent relative to their toxicities. These data indicate the effluent relative to their toxicities. These data indicate the effluent is a contributing factor in the reduced brain-AChE activity of Missouri River fishes, and that brain-AChE measurement in fishes is a sensitive and reliable indicator of such pollution. (Katz)
W76-08782

ACUTE AND CHRONIC TOXICITY OF COPPER TO THE FATHEAD MINNOW IN A SURFACE WATER OF VARIABLE QUALITY,

National Water Quality Lab., Cincinnati, Ohio. Newtown Fish Toxicology Lab.
W. A. Brungs, J. R. Geckler, and M. Gast.

Water Research, Vol. 10, p. 37-43, 1976. 7 tab, 17 ref.

Descriptors: *Toxicity, Freshwater fish, *Copper, *Sewage effluents, *Laboratory methods, *Bioassay, *Water quality, *Minnows, *Fish eggs, *Growth stages, Fish physiology, Life cycles, Laboratory tests.
Identifiers: Acute toxicity, Chronic toxicity, *Fathead minnows, Median Tolerance limit, 96-h TL50, Dissolved copper, Maximum Acceptable Toxicant Concentration.

Acute and chronic toxicity tests conducted with the fathead minnow and copper used as the source of dilution water a natural stream to which a sewage treatment plant upstream contributed a variety of materials known to affect acute copper toxicity. Nominal total copper 96-h median tolerance limit values (96-h TL50), determined with static testing procedures, ranged from 1.6 to 21 mg 1-1. Dissolved copper 96-h TL50 values ranged from 0.60 to 0.98 mg 1-1. The maximum acceptable toxicant concentration (MATC) based on survival, growth, reproduction, and hatchability of eggs was between 0.066 and 0.118 mg 1-1. (Katz)
W76-08783

HYPERHALINE ENVIRONMENTS OF THE COMPLEX OF BAGES-SIGEAN, THE LAGOON OF THE DOUL, (IN FRENCH),

Arago Lab., Banyuls-sur-Mer (France).

For primary bibliographic entry see Field 2L.
W76-08784

EFFECTS OF THERMAL CIRCULATION ON PHYTOPLANKTON PHOTOSYNTHESIS,

O. T. Lind.

Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 1829-1833, 1975, 4 tab., 6 ref.

Descriptors: *Phytoplankton, *Primary productivity, Methodology, Heated water, Electric power plants, Thermal stress, *Photosynthesis, Plankton, Aquatic productivity, *Light, *On-site investigations, *Carbon radioisotopes, Texas, Reservoirs, *Thermal pollution.
Identifiers: *C-14 technique, Tradinghouse Creek Reservoir.

Phytoplankton photosynthesis measurements were made in the intake and thermal discharge of a fossil fueled steam electric station. The maximum temperature achieved and the temperature range are both important. The data obtained suggest that some stimulus encountered in circulation such as changes in pressure and velocity may also be important. There is also a light and heated circulation interaction. (Katz)
W76-08785

ECOLOGY OF AN ANNUAL SAPROLEGNIA SP. (PHYCOMYCETE) OUTBREAK IN WILD BROWN TROUT,
D. A. White.
Verhandlungen Internationale Vereinigung, fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2456-2460, 1975 2 fig., 3 tab., 7 ref.

Descriptors: Environmental effects, *Mortality, *Spawning, Sport fish, *Trout, *Brown trout, *Fish diseases, Water temperature, *Aquatic fungi, Impoundments, Water pollution effects, Utah, Ecology.
Identifiers: *Lower Provo River(Utah), Adult spawners, Zoospores, Terrestrial leaf fall, *Saprolegnia sp.

An annual outbreak of Saprolegnia among wild spawning brown trout in a section of the Lower Provo River below the Deer Creek Dam to the Upper Falls Power Diversion Dam was investigated. The outbreak was attributed to favorable conditions for the fungus created by the higher water temperatures and the accumulated organic matter in the Deer Creek Reservoir. (Katz)
W76-08786

EXPERIMENTS ON THE EFFECTS OF INORGANIC ENRICHMENT OF RIVERS ON PERIPHYTON PRIMARY PRODUCTION,
K. Wuhrmann, and E. Eichenberger.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2028-2034, 1975, 1 fig., 6 tab., 8 ref.

Descriptors: *Primary productivity, *Eutrophication, Aquatic algae, Aquatic productivity, *Sewage, *Nitrogen, *Phosphorous, *Trace elements, Methodology, Running waters, *Periphyton, *Metals, Water pollution effects.
Identifiers: Hoaglund solution(Trace metals), Artificial channels.

Growth experiments were conducted in eight parallel artificial channels of equal gradient. It was observed that trace amounts of sewage enhanced primary production in the channels. The addition of trace metals at low concentrations enhanced productivity. With higher concentrations a tendency to growth inhibition was observed. The role of trace metals in aquatic production should be elucidated. (Katz)
W76-08787

SELECTIVE FISH MORTALITY RESULTING FROM LOW WINTER OXYGEN,
J. M. Casselman, and H. H. Harvey.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2418-2429, 1975, 8 fig., 25 ref.

Descriptors: *Freshwater fish, Fish populations, Cold-water fish, *Oxygen sag, *Dissolved oxygen, *Fish kill, Fish establishment, *Pikes, *Iced lakes, *Mortality, Lake fisheries, Sport fish, Eutrophication, Lake ice, Minnows, Canada, Water pollution effects.
Identifiers: Age composition, Size composition, Esox lucius, Yellow perch, Darters, Pimephales promelas, Manitoulin Island, Ontario, Smoky Hollow Lake.

Intraspecific selective mortalities associated with partial winter kills and low winter oxygen had a profound effect on structure of pike populations. Pike which succumbed were significantly larger than those which survived. Older pike died while only pike of age two and younger survived. Fast growing fish died, while slower growing individuals survived. This was especially true of females. Partial winter kills selected for small, young, slow-growing males. (Katz)
W76-08788

TROUT POPULATION RESPONSES TO STREAMFLOW FLUCTUATION AND HABITAT MANAGEMENT IN BIG ROCHE-A-CRI CREEK, WISCONSIN,
For primary bibliographic entry see Field 4A.
W76-08789

FISH POPULATIONS IN A LARGE GROUP OF ACID-STRESSED LAKES,
H. H. Harvey.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2406-2417, 1975 8 fig, 4 tab, 14 ref.

Descriptors: Lake fisheries, *Fish populations, *Fish reproduction, Fresh-water fish, *Air pollution, *Fallout, *Acidic water, Acids, *Chemical washes, *Lake trout, Cold water fish, Walleye, Bass, *Mineral industry, Minnows, Canada.
Identifiers: *LaCloche Mountains(Ontario), *Species diversity, Population composition, Number of species, pH range, Smelter.

A study was made of fish populations, especially number and diversity, in a group of acid-stressed lakes in the LaCloche Mountains, which are located along the north shore of Georgian Bay and North Channel of Lake Huron. There has been a loss of sport fishes from several of these lakes due in one case to the lack of reproduction. The number of fish species and the species diversity correlates positively with the distance from the nearest and largest smelter. (Katz)
W76-08790

INSHORE EFFECT OF POLLUTION ON THE BIOTA OF THE BALTIC, SOUTHERN FINLAND,
T. L. Melvasalo, R. Pesonen, Varmo, and H. Vuljamaa.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2340-2353, 1975 7 fig., 5 tab., 33 ref.

Descriptors: *Sewage, Seawater, *Primary productivity, *Estuarine environment, *Benthic fauna, *Eutrophication, Zooplankton, Animal grouping, Phytoplankton, Biomass, Surface waters, Primary treatment, Secondary treatment, Phosphorous, Nitrogen, Municipal waste, *Domestic wastes.
Identifiers: Baltic Sea, *Gulf of Finland, *Helsinki(Finland).

The domestic wastes of Helsinki have created changes in the biotic community in the Baltic Sea as a result of the eutrophication stress caused by the coastal pollution. The changes are: (1) Increase in primary production, (2) Decrease in species diversity, (3) Replacement of indigenous species by pollution-tolerant forms, (4) Seasons variability in the biotic component was maximal in the area adjacent to the coast. (Katz)
W76-08791

BIOLOGICAL EFFECTS OF PRIMARY, SECONDARY, AND TERTIARY SEWAGE TREATMENT IN LOTIC ANALOG RECIPIENTS,
Norsk Institutt for Vannforskning, Blindern.
T. S. Traaen.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2064-2069, 1975 4 tab., 12 ref.

Descriptors: Methodology, *Tertiary treatment, *Biological treatment, *Waste water treatment, *Primary productivity, *Oxygen demand, *Benthos, Chlorophyll, Artificial substrate, Monitoring, *Sewage treatment.
Identifiers: *ATP, Artificial channels, Community respiration, Selenastrum, Zoobenthos, Kjeller, Norway, Lotic analogs.

Experiments conducted in outdoor, twelve-channel system have shown that experimental channels used as recipient analogs are a sensitive tool for detecting biological community response to sewage effluent. Until the connection between chemical water parameters and biological response are better understood, recipient analog systems can be useful and effective for effluent monitoring. (Katz)
W76-08792

OBSERVATION AND MONITORING OF WATER QUALITY BY USE OF EXPERIMENTAL BIOLOGICAL METHODS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W76-08793

ALGAL GROWTH POTENTIAL OF SIX NORWEGIAN WATERS RECEIVING PRIMARY, SECONDARY AND TERTIARY SEWAGE EFFLUENTS,
T. Kallqvist.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewadte Limnologie, Vol. 19, p. 2070-2081, 1975. 11 fig., 2 tab., 1 ref.

Descriptors: Sewage treatment, Tertiary treatment, *Phosphorus, *Nitrogen, Sea water, Surface water, Waste water treatment, *Water chemistry, *Marine algae, Eutrophication, Fjords.
Identifiers: Oslo, *Norway, Selenastrum, Phaeodactylum, *Algal growth, Cell yield, Oslo Fjord.

Experiments with algal growth in mixtures of three different kinds of treated sewage and six receiving waters have shown that the growth potential depends on composition of receiving water as well as waste water. With chemically treated waste water the phosphorous concentration of the receiving water is critical. Primary wastes have the higher level of nutrients and give the greatest increase in growth potential. (Katz)
W76-08794

ASSESSMENT AND ERADICATION OF HEAVY METAL POLLUTION IN A PLANNED URBAN ENVIRONMENT,
A. H. Weatherley, P. Dawson, and L. Penridge.

Descriptors: *Heavy metals, *Copper, *Zinc, *Cadmium, *Rainbow Trout, *Brown Trout, Animal pathology, *Mine wastes, On-the-site investigation, Metals, Waste dumps, Spoil banks, Mineral industry, Reclamation, Project planning, Decision making, *Australia, Water pollution effects, Cities, Urbanization.
Identifiers: Histology, Canberra(Australia), Photomicrographs, Optimal strategy, Molonglo River, *Lake Burley Griffin(Australia).

An ornamental and recreational lake (Lake Burley Griffin, Australia) is polluted by copper and zinc from the tailings of an abondoned mine. The gill histology of rainbow trout and brown trout in the

lake is described. The gills are severely damaged. A strategy for remedying the problem is outlined. (Katz)
W76-08795

TOXICITY OF SOME CHEMICAL THERAPEUTICS TO THE COMMERCIAL SHRIMP, PENAEUS CALIFORNIENSIS,
Arizona Univ., Tucson, Environmental Research Lab.
K. S. Hanks.
Aquaculture, Vol. 7, p. 293-294, 1976. 1 tab., 2 ref.

Descriptors: Aquiculture, Diseases, Pathology, *Bioassay, *Toxicity, *Commercial shellfish, *Shrimp, *Copper sulfate, Potassium compounds, Fungicides, Mortality, Laboratory tests, Water pollution effects.
Identifiers: Penaeus californiensis, Therapeutics, Cutrine, Malachite Green, Methylene blue.

Information is presented concerning the toxicity of methylene blue, copper sulfate, cutrine, potassium permanganate, formaline-malachite green, and hyamine to Penaeus californiensis. (Katz)
W76-08796

LABORATORY AND FIELD TESTS OF TEMPERATURE TOLERANCE ON GAMBUSIA A. AFFINIS, THE WESTERN MOSQUITOFISH,
S. D. Gerking, T. Ratcliff, and R. G. Otto.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2498-2503, 1975, 3 fig., 2 tab., 4 ref.

Descriptors: *Bioassays, *Thermal stress, *Heated water, *Thermal stress, Mortality, Freshwater fish, Warm springs, Methodology, Water temperature, *Laboratory tests, On-site investigations.
Identifiers: *Mosquito fish, Gambusia affinis, Median survival time, Upper incipient lethal levels, Critical thermal maximum.

Fish acclimated to constant temperatures in the laboratory and those acclimated to fluctuating temperatures in the field yield similar median survival times, similar upper incipient lethal levels and similar critical thermal maxima (CTM). The process of acclimation is the same under the two sets of conditions. Exposure to increasingly higher acclimation temperatures increases median survival times and CTM at temperatures above or bordering on the upper lethal limit. Males, fry and immatures are more heat resistant than are adult females. (Katz)
W76-08798

INFLUENCE OF MINERAL FERTILIZATION OF LAKES ON FISH GROWTH,
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
Z. Marciak.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p. 2582-2588, 1975 5 fig, 4 ref.

Descriptors: *Eutrophication, Freshwater fish, Commercial fish, *Food habits, Fish populations, *Food chains, Lake fisheries, *Fertilization, *Growth rates, Minnows, Fish management, Fish diets, Zooplankton, Benthos, Environmental effects, Stratification, Lakes.
Identifiers: Bream, Roach, Pike-Perch, Growth assessment, *Poland, Lake Ozarnakuta, Lake Dgal Maly.

Fish species responded differently to the increase in nutrients in two lakes at various stages of eutrophy and different morphometry. Bream in a deep, stratified lake had an accelerated growth, while in a shallow, highly eutrophic lake the growth rate of the same species was diminished. Growth was correlated with amount and sizes of bottom organisms and pelagic crustaceans. In both lakes the growth rate of roach decreased and that of pike-perch increased. Decreasing transparency had a different effect on the growth of fishes. (Katz)
W76-08799

PHOSPHORUS AVAILABILITY IN PARTICULATE MATERIALS TRANSPORTED BY URBAN RUNOFF,
Wisconsin Univ., Madison. Water Chemistry Program.
For primary bibliographic entry see Field 5B.
W76-08804

STUDIES ON PHOSPHORYLATION COUPLED WITH DENITRIFICATION AND AEROBIC RESPIRATION IN PSEUDOMONAS DENITRIFICANS,
Nagoya Univ. (Japan). Biological Inst.
H. Terai, and T. Mori.
Botanical Magazine, Vol. 88, No. 1011, p. 231-244, 1975. 5 fig., 7 tab., 31 ref.

Descriptors: *Cytological studies, *Denitrification, *Aerobic conditions, *Phosphates, *Pseudomonas, Respiration, Inhibitors, Biochemistry, Oxidation.
Identifiers: *Phosphorylation, Adenosine triphosphate.

To determine how much, if any, phosphorylation is coupled with denitrification in intact cells or cell-free Pseudomonas denitrificans sysems, the formation of adenosine triphosphate during aerobic respiration and denitrification was measured. In intact cells, adenosine triphosphate formation associated with aerobic respiration when lactate was used as an electron donor. Potassium cyanide, sodium azide, and 2,4-dinitrophenol inhibited the formation of adenosine triphosphate. When ammonium hydroxide, dimethyl-p-phenylenediamine, or tetramethyl-p-phenylenediamine were used as electron donors, no phosphate uptake occurred; however production of nitrous oxide, nitrogen, or nitric oxide from nitrite was accelerated under anaerobic conditions. In cell-free systems, the formation of adenosine triphosphate was shown by using an adenosine triphosphate trapping system with lactate as the substrate. The effects of the various inhibitors were about the same as those observed with intact cells. Dimethyl-p-phenylenediamine or tetramehtyl-p-phenylenediamine together with ascorbate favored adenosine triphosphate formation during aerobic oxidation in a cell-free system; no stimulation of adenosine triphosphate formation was observed during denitrification. (Buchanan-Davidson--Wisconsin).
W76-08823

THE IN VITRO SENSITIVITY OF SOME SPECIES OF CHLOROPHYCEAE TO A SELECTED RANGE OF HERBICIDES,
Saskatchewan Univ., Regina. Dept. of Biology.
D. R. Cullimore.
Weed Research, Vol. 15, No. 6, p. 401-406, 1975. 1 fig., 2 tab., 11 ref.

Descriptors: *Chlorophyta, *Herbicides, *Algicides, *Algal control, Monuron, Paraquat, Diquat, Delapon, 2,4,5-T, Urea pesticides, Phytotoxicity, Inhibitors, Varieties, Resistance, Rates of application.
Identifiers: Phenylalkanoic herbicides, Bromacil, Linuron, 2,4-DB, Barban, Dicamba, Dichlobenil, Picloram, Bromoxynil, 2,3,6-TBA, 2,4-DP, EPTAM.

To obtain an index of potential algicidal activity, commercially available herbicides were routinely scanned against seventeen axenic Chlorophyceae algal species. Algal strains varied in their sensitivity to herbicides. Chlorella ellipsoidea was the only alga resistant to all herbicides studied. Hormidium and Haematococcus were the most sensitive genera. Hormidium barlowi was sensitive to the broadest spectrum of herbicides, but its low sensitivity makes it unacceptable for direct soil assay. Haematococcus lacustris was highly sensitive to a wide spectrum of herbicides and would be suitable for monitoring urea and bipyridyl herbicides. Other herbicides may interfere with bioassay accuracy, since no algal strain was sensitive to a single herbicide. Diuron and bromacil had the broadest spectrum, inhibiting 15 of 17 algal strains, but diuron inhibited growth at lower concentrations. Among urea herbicides, diuron had the broadest, monuron an intermediate, and linuron did not inhibit growth completely at as low concentrations as diuron. Of bipyridyl herbicides, paraquat had a broader spectrum than diquat. Of phenylalkanoic herbicides, 2,4-DB was more inhibitory than 2,4-DP. Herbicides in sequence from most inhibitory to non-inhibitory were diuron>bromacil>paraquat>monuron>diquat>linuron>2,4-DB>barban>dicamba, dichlobenil, dalapon, picloram>bromoxynil, 2,3,6-TBA>2,4-DP,>2,4,5-T and EPTAM. (Buchanan-Davidson--Wisconsin)
W76-08824

BIOMASS PARAMETERS AND PRIMARY PRODUCTION AT A NEARSHORE AND A MIDLAKE STATION OF LAKE ONTARIO DURING IFYGL,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
P. Stadelman, and M. Munawar.
In: International Association Great Lakes Research, Proceedings 17th Conference on Great Lakes Research, p. 109-119, 1974. 1 fig., 8 tab., 17 ref.

Descriptors: *Phytoplankton, *Biomass, *Primary productivity, *Lake Ontario, *Fluctuations, International hydrological decade, Carbon, Organic matter, Photosynthesis, Seasonal, Phosphorus, Chlorophyll, Detritus, Algae, Inorganic compounds, Nitrogen, Lakes.
Identifiers: Adenosine triphosphate.

To compare biomass parameters and the relationships between biomass and photosynthesis rates, seasonal variations in particulate organic carbon and nitrogen, particulate phosphorus, chlorophyll-a, adenosine triphosphate, and phytoplankton biomass were studied at nearshore and midlake stations of Lake Ontario. Photosynthesis rates, using carbon-14, measured on two consecutive days were related to biomass parameters. All nearshore parameters were high in June and July. The midlake station showed a lag in biomass increase in the spring; maxima were observed later in July and September. Detrital carbon exceeded phytoplankton and living carbon. Even during high algal density, detrital carbon was 50%, consequently only 20-25% particulate carbon was bound in algal and living material. Problems in determining various parameters are discussed; each parameter has inherent problems and there is no standard to which a proposed parameter can be compared. If total living biomass determinations are required quickly, adenosine triphosphate can be determined. To describe the conversion of inorganic nutrients to biomass, particulate organic carbon and nitrogen and particulate phosphorus may give a first approximation of biomass if large amounts of detritus are not present. Algal biomass determinations by phytoplankton identification and enumeration can yield biomass estimates, with the added information about algal species composition, and size distribution. (Buchanan-Davidson--Wisconsin)
W76-08825

OBSERVATIONS OF COLONIAL MULTIPLICATION IN A RAPIDLY GROWING ALGA,

GONIUM MULTICOCCUM POCOCK (VOLVOCACEAE),
Hokkaido Univ., Muroran (Japan). Inst. of Algological Research.
S. Saito, and T. Ichimura.
Botanical Magazine, Vol. 88, No. 1011, p. 245-247, 1975. 6 fig., 1 tab., 5 ref.

Descriptors: *Algae, *Growth rates, Growth stages, Period of growth, Photography, Laboratory tests, Cultures, Temperature, Reproduction, Asia, Ponds.
Identifiers: *Gonium multicoccum, *Nepal, Rain pools.

A strain of Gonium multicoccum Pocock was isolated from dried mud collected from a rain water pool in Central Nepal. A microphotographic method was used to estimate the growth rate of this organism when grown on an agar surface. Cultures were incubated at 10-36C under 3500 lux illumination. Due to heterotrophic nature, inoculated colonies grew faster at higher temperatures. At 36C three vegetative generations were observed during 15 hours, while at 14C there was no significant growth. When synchronous cell divisions and daughter colony formations were studied by time-lapse photomicrography, it was observed that each cell in a 16-celled colony divided successively 4 times to form a 16-celled daughter colony. The shortest generation time with respect to colony reproduction was estimated to be approximately 8 hours. If it is assumed that a colony consistently reproduces by a factor of 16 with a generation time of 8 hours; the cellular growth constant K which expresses a number of cell doublings per day was calculated to be 12. This would place this organism among the most rapidly growing algae among those known in laboratory cultures. (Buchanan-Davidson--Wisconsin).
W76-08826

VALYL TRNA'S OF ANACYSTIS NIDULANS,
Magyar Tudomanyos Akademia, Szeged. Novenyelettani Kutato Intezet.
A. Gozdzicka-Jozefiak, D. Labuda, G. Bagi, G. Borbely, and G. L. Farkas.
Phytochemistry, Vol. 14, No. 11, p. 2375-2377, 1975. 2 fig., 25 ref.

Descriptors: *Cytological studies, *Biochemistry, *Cyanophyta, Amino acids, Synthesis, Enzymes, Bacteria.
Identifiers: Aminoacyl synthesis, Ribonucleic acid, *Anacystis nidulans.

Relationships of blue-green algae to bacteria and/or chloroplasts and eukaryotic cells were studied. Conclusions about the relatedness of organisms and/or organelles from which components are derived can be drawn from study of tRNAs and their cognate aminoacyl synthetases. This hypothesis was investigated as Anacystis nidulans valyl-tRNA isoacceptors in homologous and heterologous systems. A. nidulans valyl-carbon-14-aminoacylated-tRNA charges with homologous synthetase separated into three distinct isoacceptor during chromatography. Elution patterns of valyl-carbon-14-tRNAs of the same tRNA preparations charges with aminoacyl synthetase from dark-grown and light-grown barley seedlings or yeast showed that all enzyme preparations aminoacylated the three valyl-tRNA isoacceptors. The extent of individual isoacceptors aminoacylation was different in homologous and heterologous systems; two isoacceptors eluted by lower sodium chloride molarities were less charged in heterologous systems than the isoacceptor eluted with higher sodium chloride concentrations. Elution profiles of all three heterologous systems were similar. The results suggest that an enzyme synthesized other than in the chloroplasts is responsible for charging. A. nidulans aminoacyl synthetase recognized valyl-tRNA isoacceptors from barley root tissues the same way as barley synthetase. There are exceptions to the principle that prokaryotic tRNAs are preferentially recognized by prokaryotic enzymes. (Buchanan-Davidson--Wisconsin).
W76-08827

SUMMER PHYTOPLANKTON PHOTOSYNTHESIS IN A NORTHEASTERN OHIO GLACIAL LAKE,
Akron Univ., Ohio. Dept of Biology.
G. McMurray, and J. H. Olive.
Ohio Journal of Science, Vol. 75, No. 5, p 238-250, 1975. 9 fig., 36 ref.

Descriptors: *Summer, *Phytoplankton, *Photosynthesis, *Limiting factor, *Ohio, Lakes, Autumn, Euglenophyta, Cyanophyta, Chlorophyta, Diatoms, Varieties, Carbon, Euphotic zone, Phosphorus, Toxicity, Hydrogen sulfide, Hypolimnion, Epilimnion.
Identifiers: *Sandy Lake(Ohio).

To analyze relationships between photosynthesis, the summer phytoplankton community composition and selected physical-chemical factors in Sandy Lake, Ohio, were studied. About 50 phytoplankton species were found in the summer and autumn of 1971. Euglenophyta were dominant, often accounting for over 50% of the phytoplankton volume. Blue-green algae, at least 14 green algae species, and 14 diatom species were also present, but usually their cell volumes were small. Ceratium hirundinelle, Glenodinium, and Dinobryon appeared in brief pulses, occasionally accounting for large fractions of the total cell volume. The phytoplankton total volume ranged between 21,500-55,800 cu mm/sq m. Mean cell volumes were 7.3, 6.3, 4.1, and 3.5 cu mm/l at 1,2,4, and 6 m depths, respectively. The average daily rate of integral photosynthesis was 944 mg carbon/sq m. Relative photosynthesis in the upper photic zone was 7.9 micrograms carbon/cu/mm/hr. The most striking feature of the photosynthetic pattern was a sharp decline and prolonged depression in photosynthetic rates after August 23, which was probably due to a reduction in phosphorus supply and toxic conditions caused by hydrogen sulfide diffusion from hypolimnion to epilimnion. (Buchanan-Davidson--Wisconsin)
W76-08828

A RESERVOIR COVE ECOSYSTEM MODEL,
Georgia Univ., Athens. Dept. of Zoology.
B. C. Patten.
Transactions of the American Fisheries Society, Vol. 104, No. 3, p. 596-619, 1975. 17 fig., 3 tab., 16 ref.

Descriptors: *Computer models, *Model study, *Fish management, *Reservoir, *Ecosystems, *Oklahoma, *Texas, Primary productivity, Aquatic plants, Zooplankton, Vertebrates, Fish, Benthic fauna, Invertebrates, Decomposing organic matter, Inorganic compounds, Organic matter, Carnivores, Thermal pollution, Eutrophication.
Identifiers: *Lake Texoma(Texas-Okla), Perturbation effects, Compartment models.

A compartment model or biological description of the reservoir cove ecosystem in Lake Texoma, Texas-Oklahoma, is described. The primary producer submodel consists of nine plant groups aggregated according to size habitat, growth form, taxonomy, and physiology; producer-related processes and factors include photosynthesis, light available for photosynthesis, precipitation, plant metabolism, nitrogen fixation, excretion, mortality, and effects of water level changes. Zooplankton-related processes modeled included feeding, reproduction, metabolism, generation of dissolved and particulate excretory products, and predatory and nonpredatory mortality. Vertebrate (especially fish) compartments are based on taxonomy, feeding, and size; the modeled processes included feeding, breeding, reproduction, growth, metabolism, secretion, excretion, nonpredatory mortality, and harvest. Benthic macroinvertebrates are separated by feeding habits; modeled processes include feeding, metabolism, excretion, nonpredatory mortality, and emergence. Decomposers were separated into dead organic matter and inorganic element compartments. The fish submodel is emphasized. Nominal, unperturbed annual cycles of selected compartments are presented and results of perturbation experiments by thermal pollution, eutrophication, and piscivore invasion are summarized. Fish influence the whole ecosystem's structure and function. The role of top trophic levels in control of ecological community designs and the status and use of total ecosystem modeling as tools for fisheries science are discussed. (Buchanan-Davidson--Wisconsin)
W76-08830

ZOOPLANKTON OF WESTERN LAKE ERIE AT PUT-IN-BAY: A QUANTITATIVE STUDY, APRIL 1973-MARCH 1974,
Ohio State Univ., Put-in-Bay. Center for Lake Erie Area Research.
V. M. Reutter, and J. M. Reutter.
Ohio Journal of Science, Vol. 75, No. 5, p. 256-262, 1975. 5 fig., 1 tab., 13 ref.

Descriptors: *Zooplankton, *Lake Erie, *Ohio, Rotifers, Copepods, Crustaceans, Succession, Great Lakes.
Identifiers: *Put-in-Bay(Lake Erie), Polyarthra, Nauplii, Bosmina, Cladocerans, Calanoid Copepods, Cyclopoid copepods.

In order to study qualitatively and quantitatively the zooplankton of western Lake Erie and compare current populations with previous studies, zooplankton were collected from Put-in-Bay Harbor, Ohio, between April 1973-March 1974. Forty-six taxa of zooplankton were collected. Polyarthra was the most abundant rotifer, nauplii the most populous copepods, and Bosmina the most common cladoceran. In the 117 samples collected, rotifer, copepod, and cladoceran populations all reached their peaks in June. In addition the cladocerans peaked in October. The monthly mean rotifer populations were always the largest and the cladoceran populations the smallest. By separating the total copepod population into calanoid copepods, cyclopoid copepods, and nauplii, differences between calanoid and cyclopoid copepods were accented and the results were more comparable to earlier studies. Rotifer and nauplii populations generally showed increases, cyclopoid copepod populations remained relatively unchanged, and the calanoid copepod and cladoceran populations decreased when compared to earlier investigations. The variations in sampling methods and location of sampling stations are considered. The present results may only be typical of the near-shore sections of Put-in-Bay Harbor and may not be comparable to results obtained from the open lake. (Buchanan-Davidson--Wisconsin)
W76-08833

CHANGES IN THE ALGAL FLORA OF EAST HARBOR, OTTAWA COUNTY, OHIO, SINCE 1900,
Ohio State Univ., Columbus. Dept. of Botany.
V. R. Frederick.
Ohio Journal of Science, Vol. 75, No. 5, p. 229-237, 1975. 1 fig., 3 tab., 16 ref.

Descriptors: *Algae, *Succession, *Lake Erie, Varieties, *Ohio, Periphyton, Submerged plants, Euglenophyta, Chara, Perihyton, Water chemistry, Dredging, Great Lakes, Lakes.
Identifiers: *East Harbor(Lake Erie), Desmids, Chlorococcales, Dinophyceae, Myxophyceae.

Algal flora collected from the Lake Erie East Harbor, Ottawa County, Ohio, were compared with collections from 1900 to the present. Only four additional algal taxa have been reported from 1945 until the present 1974 study. In this study, 161 algal taxa were identified and compared to 151 taxa re-

ported in 1971. Of the 265 taxa which have been reported, only 47 taxa (18%) were common to this and all previous studies. Only 31% of those reported before 1974 were present. Major differences were observed in the algal flora in the epiphytic taxa, desmids, planktonic chlorococcales, Charophyceae, Euglenophyceae, Dinophyceae, and several genera of Myxophyceae. Few epiphytic algal taxa were found although many had been previously reported. These differences may be due to natural and man-induced disturbances; the major impact was due to dredging in 1967, which deepened the harbor, destroyed much of the submerged vegetation, and altered the water chemistry. The Euglenophycean taxa had increased; they were collected in shallow backwater pools in the beach area whichhad been created by the dredging and had been filled by recent high water levels. Deepening and destruction of Chara taxa by the dredging accounted for the recent changes in Charophyceae. (Buchanan-Davidson--Wisconsin)
W76-08834

DIATOM COMMUNITY RESPONSE TO VARIATIONS IN EFFLUENT CONCENTRATION,
Liverpool Polytechnic (England). Dept. of Biology.
G. H. Evans, and E. Marcan.
Environmental Pollution, Vol. 10, No. 2, p. 115-126, 1976. 3 fig., 5 tab., 20 ref.

Descriptors: Rivers, *Diatoms, *Water pollution effects, Sewage effluents, Biological communities, *River flow, Succession, Ecological distribution, Varieties, Europe.
Identifiers: *Ribble River(England), Diatoma vulgare, Achnanthes minutissima, Cymbella ventricosa, Melosira varians, Fragilaria capucina, Nitzschia palea, Nitzschia communis, Navicula atomus, Gomphonema parvulum.

River flow conditions were simulated in troughs containing stones from River Ribble, Settle, Yorkshire, England. Flow conditions were maintained using 'clean' river water or various proportions of treated sewage effluent (approximately 70% dairy waste and 30% domestic sewage). In the clean river water trough, the original diatom community changed from one dominated by Diatoma vulgare, Achnanthes minutissima, and Cymbella ventricosa to one dominated by Achnanthes associated with Melosira varians, Fragilaria capucina, and Cymbella ventricosa. In troughs with effluent, the community was dominated by Nitzschia palea, N. communis, Navicula atomus, and Gomphonema parvulum. Although Achnanthes is an indicator of well aerated, clean water, it was present in the trough containing only treated effluent. Variations in effluent concentration did not change the succession sequence in diatom communities; the change was slow, requiring about a week. Diatom numbers remained fairly constant, but more species were in the troughs with cleaner water. It is postulated that a seasonal trend was shown by the increase in diatom numbers. Melosira varians and Diatoma vulgare showed similar frequencies and trends in all troughs suggesting that they were indifferent to the effluent. (Buchanan-Davidson--Wisconsin)
W76-08835

NUTRIENT-PRIMARY PRODUCTION RELATIONSHIPS IN CENTRAL LAKE ERIE: A SIMPLE CORRELATION APPROACH,
Canada Centre for Inland Waters, Burlinton (Ontario).
W. A. Glooschenko.
Ohio Journal of Science, Vol. 75, No. 5, p 251-255, 1975. 2 tab., 15 ref.

Descriptors: *Nutrients, *Primary productivity, *Lake Erie, *Correlation analysis, Phytoplankton, Biomass, Chlorophyll, Water temperature, Nitrogen compounds, Phosphorus, Silica, Seasonal, Limiting factors, Great Lakes, Lakes.
Identifiers: Particulate phosphorus.

Correlation coefficients were determined between primary production, phytoplankton biomass, chlorophyll-a, temperature, nitrogen, phosphorus, and silica in samples obtained from the Central Basin of Lake Erie between April-December 1970. There was no correlation between chlorophyll-a and production until July. In June temperature and soluble reactive, total, and total filtered phosphorus showed significant correlations with the assimilation number. Total filtered and soluble reactive phosphorus showed no correlation with primary production. In the summer soluble reactive phosphorus was almost depleted to a limiting level and correlations were found between carbon-14 uptake and soluble reactive phosphorus; such correlations were lacking in spring and fall. Total phosphorus showed a positive correlation with primary production, except in April and late September. The most significant relationship was between primary production and particulate phosphorus which may be an indicator of biomass. Primary production correlated with nitrates-nitrites from June-late August and ammonium between June-early August, suggesting a possible summer nitrogen limitation. There was a correlation between chlorophyll-a and nitrates-nitrites in August. Silica was non-limiting for diatoms in the spring, may have been limiting in the summer, and showed a negative correlation from late October to mid-December. Primary production was significantly affected by nutrients with temperature of secondary importance. (Buchanan-Davidson-Wisconsin).
W76-08836

ISOLATION AND CHARACTERIZATION OF ACTINOPOLYSPORA HALOPHILA, GEN. ET SP. NOV., AN EXTREMELY HALOPHILIC ACTINOMYCETE,
Ottawa Univ. (Ontario). Dept. of Biology; and Ottawa Univ. (Ontario). Dept. of Biochemistry.
M. B. Gochnauer, G. G. Leppard, P. Komaratat, M. Kates, and T. Novitsky.
Canada Journal of Microbiology, Vol. 21, p 1500-1511, 1975. 16 fig., 5 tab., 43 ref.

Descriptors: *Bacteria, *Salt tolerance, *Actinomycetes, *Systematics, Classification, Plant morphology, Nutrient requirements, Salinity, Pollutant identification.
Identifiers: *Actinopolyspora halophila, Nocardiaceae.

An extremely halophilic actinomycete isolated from a medium containing 25% sodium chloride is classified as Actinopolyspora halophila (ATCC 27976) of the Nocardiaceae family. Its morphological and chemical properties distinguish it from other Nocardiaceae and genera having a type IV cell wall. It requires high sodim chloride concentrations for growth, and grew in saturated salt. In liquid medium the lowest salt concentration permitting growth was 12% and on solid medium, 10%. At lower salt concentrations, colonies develop holes resembling viral plaques. No growth occurred in media containing 30% potassium chloride substituted for sodium chloride. It grew on simple media containing ammonium salts as nitrogen sources and sugars and other compounds as carbon sources. Tweens 20, 40, 60, 80 and casein were hydrolyzed, but urea, xanthine, and starch were not; gelatin was liquified, but nitrates were not reduced. It requires as much salt as extremely halophilic rods and cocci, but contains diaminopimelic acid and is sensitive to lysozyme, which suggests that it has a mucopeptide cell wall. It is resistant to penicillin. It contains some phospholipids common to other actinomycetes but no phytanyl ether linked lipids. Its temperature range is 10-43C; optimum 37C. (Buchanan-Davidson-Wisconsin)
W76-08837

ENVIRONMENTAL EFFECTS OF COOLING SYSTEMS AT NUCLEAR POWER PLANTS,
International Atomic Energy Agency, Vienna (Austria).
Available as STI/PUB/378, from UNIPUB, New York, N. Y. Proceedings of a symposium on the Physical and Biological Effects on the Environment of Cooling Systems and Thermal Discharges at Nuclear Power Stations held in Oslo, August 26-30 1974. CONF-740820, 1975, (832 p).

Descriptors: *Conferences, *Thermal pollution,*Environmental effects, Nuclear power plants, International commissions.

The symposium was organized by the International Atomic Energy Agency with the cooperation of Secretariat of the United Nations Economic Commission for Europe. A total of 49 papers from 15 countries and one international organization are presented in the volume. Areas of interest covered are the introductory papers; heat dissipation, the physical behavior of heated effluents in the atmosphere and various aquatic systems; effects on biota and environment ecosystems, including synergistic effects; criteria for the establishment of thermal release standards; and alternative methods for the management of heated effluents, and possible beneficial uses of waste heat. Among the papers of particular interest were two describing the behavioural responses of fish to a nuclear power plant discharge. (See W76-08849 thru W76-08888) (Chilton-ORNL)
W76-08848

MANAGEMENT OF WASTE HEAT AT NUCLEAR POWER STATIONS, ITS POSSIBLE IMPACT ON THE ENVIRONMENT, AND POSSIBILITIES OF ITS ECONOMIC USE,
Atomic Energy Commission, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-08849

ENVIRONMENTAL ASPECTS OF THE COOLING SYSTEMS OF THERMAL POWER STATIONS: REPORT ON THE SEMINAR HELD AT ZURICH, MAY CONCLUSIONS AND RECOMMENDATIONS, (LES ASPECTS D'ENVIRONMENT DES SYSTEMS DE REFROIDISSEMENT DES CENTRALLES THERMIQUES),
Economic Commission for Europe (UN), Geneva (Switzerland). Div. of Energy.
For primary bibliographic entry see Field 6G.
W76-08850

A TWO-DIMENSIONAL HYDRODYNAMIC MODEL FOR COOLING-TOWER PLUMES,
Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen (Switzerland).
For primary bibliographic entry see Field 5B.
W76-08851

COMBINED DRY/WET-COOLING TOWERS: THEIR ENVIRONMENTAL PROMISE AND THEIR PROBLEMS,
Motor-Columbus Consulting Engineers Inc., Baden (Switzerland).
For primary bibliographic entry see Field 5B.
W76-08852

ATMOSPHERIC DISPERSION OF COOLING-TOWER BLOWDOWN,
Environmental Systems Corp., Knoxville, Tenn.
For primary bibliographic entry see Field 5B.
W76-08853

FOG FORMATION AND FOG ELIMINATION,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
For primary bibliographic entry see Field 5G.
W76-08854

COOLING TOWER EXPERIENCE AND THE METEOROLOGICAL CONSEQUENCES OF

THERMAL DISCHARGES FROM NUCLEAR POWER PLANTS IN THE FEDERAL REPUBLIC OF GERMANY,
Deutscher Wetterdienst, Offenbach am Main (West Germany).
For primary bibliographic entry see Field 5G.
W76-08855

TRAPPING OF HEAT IN SILL FJORDS,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
T. Carstens.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820. Proceedings of a symposium held at Oslo, August 26-30, 1974. p 99-112, 11 fig, 7 ref.

Descriptors: *Geomorphology, *Fjords, *Heated water, Temperature, Salinity, Stratification, Topography.

The fjords discussed here have in common a bottom with sills, which are transverse ridges generally of glacial origin. The fjords are strongly stratified with freshwater. The combined effects of topography and layering create bodies of water that are sheltered to a large extent from advective and diffusive processes. The deep basins behind sills are characterized by long residence times and the unconfined water masses above the sill depth have movements that are normal for inshore waters. Annual renewal of the deep water occurs, the exchange cycle being asymmetric and consisting of a rapid gravitational inflow followed by a slower diffusive outflow. Salinity variations are responsible for the gravitational inflow with temperature effects being negligible. Waste heat near a shallow sill may end up at the bottom of a deep basin unless it is mixed into the brackish surface layer. (See also W76-08848) (Chilton-ORNL)
W76-08856

COMPUTATIONS OF THE TEMPERATURE RESPONSE OF STRATIFIED SILL FJORDS TO COOLING-WATER DISCHARGES,
Norges Tekniske Hoegskole, Trondheim. River and Harbor Lab.
For primary bibliographic entry see Field 5B.
W76-08857

HEAT DISCHARGES INTO THE SEA AT THE OLKILUOTO SITE: LABORATORY MODEL TEST RESULTS AND REASONS FOR SELECTED ARRANGEMENTS,
Teollisuuden Voima OY Industrins Kraft Ab. Kile (Finland).
For primary bibliographic entry see Field 5B.
W76-08858

HEATING OF ESTUARINE AND COASTAL WATERS BY NUCLEAR POWER STATIONS IN FRANCE, (ECHAUFFEMENT DES EAUX PAR DES CENTRALES NUCLEAIRES EN ESTUAIRE ET BORD DE MER EN FRANCE),
Laboratoire National d'Hydraulique, Chatou (France).
For primary bibliographic entry see Field 5B.
W76-08859

A COMPARISON OF AERIAL INFRA-RED AND IN-SITU THERMAL PLUME MEASUREMENT TECHNIQUES,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5A.
W76-08860

THE CHALK POINT COOLING TOWER PROJECT,
Maryland Dept. of Natural Resources, Annapolis. Power Plant Siting Program.
For primary bibliographic entry see Field 5B.
W76-08861

SEASONAL FEATURE OF THERMAL ABATEMENT OF SHORELINE DISCHARGES AT NUCLEAR SITES,
Bhabha Atomic Research Centre, Bombay (India). Environmental Studies Section.
For primary bibliographic entry see Field 5G.
W76-08862

UNITED KINGDOM EXPERIENCE OF THE PHYSICAL BEHAVIOUR OF HEATED EFFLUENTS IN THE ATMOSPHERE AND IN VARIOUS TYPES OF AQUATIC SYSTEMS,
Central Electricity Generating Board, London (England).
For primary bibliographic entry see Field 5B.
W76-08863

THE SIGNIFICANCE OF ISOMERY IN HYGIENIC STANDARDIZATION OF INDUSTRIAL CONTAMINATIONS OF WATER BODIES, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinakii Institut (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5A.
W76-08864

WASTE-HEAT DISPOSAL FROM STEAM ELECTRIC PLANTS WITH REFERENCE TO THE STOCHASTIC NATURE OF SOME ENVIRONMENTAL CONDITIONS AND TO THERMAL POLLUTION CONTROL REGULATIONS,
Energoprojekt, Belgrade, (Yugoslavia).
For primary bibliographic entry see Field 5G.
W76-08865

A MODEL FOR SALT DRIFT DEPOSITION FROM SPRAY PONDS,
Massachusetts Institute of Tech., Cambridge.
For primary bibliographic entry see Field 5B.
W76-08866

THE TOTAL HEAT-EXCHANGE COEFFICIENT OF SURFACE WATERS,
Bundesanstalt fuer Gewasserkunde, Coblenz (West Germany).
For primary bibliographic entry see Field 5B.
W76-08867

TWO METHODS OF MEASURING THE HEAT DISSIPATION OF DISCHARGED COOLING WATER: A PHENOMENOLOGICAL APPROACH,
Keuring van Electrotechnische Materialen N.V., Arnhem (Netherlands). Environmental Dept. of the Central Lab.
For primary bibliographic entry see Field 5B.
W76-08868

THERMAL DISCHARGE STUDIES ON THE GREAT LAKES-THE CANADIAN EXPERIENCE,
Ontario Hydro, Toronto.
For primary bibliographic entry see Field 5G.
W76-08869

ECOLOGY OF ARTIFICIALLY HEATED STREAMS, SWAMPS AND RESERVOIRS ON THE SAVANNAH RIVER PLANT, THE THERMAL STUDIES PROGRAM OF THE SAVANNAH RIVER ECOLOGY LABORATORY,
Savannah River Ecology Lab. Aiken, S. C.
J. W. Gibbons, R. R. Sharitz, F. G. Howell, and M. H. Smith.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium, Oslo, August 26-30, 1974, p 389-400, 2 fig, 29 ref.

Descriptors: *Thermal pollution, *Environmental effects, Populations, Habitats, Streams, Swamps, Reservoirs, *South Carolina, *Ecology.
Identifiers: Savannah River Plant(SC).

The paper describes studies that have been undertaken in a variety of habitats at the Savannah River Plant. The area provides opportunities to observe thermal habitats with temperatures ranging from normal for the area to above 50 degrees C; post-thermal stream, swamp and lake habitats; and natural areas for use as control environments. The study includes the responses of species populations as well as of individuals to thermal loading. The studies of species diversity and composition show at least two basic patterns of community response to thermal insult. The determining variable appears to be the degree in which the communities are physically related to thermal loading. Aquatic communities can respond only within the limits permitted by the pollutant while terrestrial components are not so tightly bound to the physical restrictions of thermal stress. (See also W76-08848) (Chilton-ORNL)
W76-08870

EFFECTS OF A THERMAL DISCHARGE INTO A RIVER ON THE MOVEMENT OF FISH POPULATIONS, (INCIDENCES D'UN REJET THERMIQUE EN MILIEU FLUVIAL SUR LES MOUVEMENTS DES POPULATIONS ICHTYOLOGIQUES),
Centre Technique du Genie Rural des Eaux et des Forets, Paris (France). Laboratoire des Micropolluants.
G. Leynaud, and J. Allardi.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium, Oslo, August 26-30, 1974. p 401-408, 1 fig, 10 ref.

Descriptors: *Thermal pollution, *Environmental effects, Populations, Varieties, Fish, Seasonal, *Water pollution effects.
Identifiers: Montereau Thermal Power Station(France), Seine River(France).

The study was made at the Montereau Thermal Power Station on the Seine River. Electrofishing and lobster pots were used to make regular catches in the discharge channel of the station. Movements of fish were traced by labelling and subsequent recatching and by the assistance of amateur fishermen. Numbers of fish caught in the discharge ranged from a maximum in the spring and fall to a minimum in the summer and winter. Composition of populations also varied with an increase in the proportion of Cyprinidae during hot periods. Barbels disappeared during hot periods. Black bass populations increased during times of high temperature. Gammaridae also disappeared during the summer months. (See also W76-08848) (Chilton-ORNL)
W76-08871

THERMAL STUDIES ON TROPICAL MARINE ECOSYSTEMS IN PUERTO RICO,
Puerto Rico Nuclear Center, Rio Piedras. Radioecology Div.
S. E. Kolehmainen, F. D. Martin, and P. B. Schroeder.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974, p 409-422, 4 tab, 4 fig, 13 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Tropical regions, *Ecosystems, Marine algae, Marine animals, Marine plants, *Puerto Rico.

In addition to temperatures 10 degrees C above ambient water temperature, organisms in Guayanilla Bay were exposed to hydrocarbon and heavy metal pollution. Results indicated that approximately 95% of zooplankters were killed in condensers and the discharge canal with further mortality occurring within 100 m from the mouth of the discharge canal. Species diversity and

biomass were highest at 1 to 6 degrees above ambient temperatures. It was seen that most of the mortality was due to relatively long exposures to elevated temperatures in the discharge canal rather than to short exposures in condensers or mechanical damage in the water pumps. The number of species in the heated area was 28 compared with 53 in the control area. The species most tolerant to elevated temperatures were bluegreen algae, mangrove trees, certain molluscs, crabs and fish while the most sensitive organisms were red and brown algae, coelenterates and echinoderms. (See also W76-08848) (Chilton-ORNL)
W76-08872

ENVIRONMENTAL EFFECTS OF THE HEATED DISCHARGES FROM BRADWELL NUCLEAR POWER STATION, AND OF THE COOLING SYSTEMS OF OTHER STATIONS,
Central Electricity Generating Board, London (England). Planning Dept.
F. B. Hawes, J. Coughlan, and J. F. Spencer.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 423-448, 8 fig, 3 tab, 15 ref, 1 append.

Descriptors: *Thermal pollution, *Environmental effects, Powerplants, Aquatic life, Europe cooling water.
Identifiers: Bradwell Nuclear Power Station(England), River Blackwater(England).

Mean monthly increases in temperature resulting from operation of the power station were found to be between 0.2 and 1.7 degrees C on the south shore of River Blackwater near the outfall and less than 0.7 degree C on the north shore, compared to an annual range of seawater temperature of approximatley from 4 to 19 degrees C. It was found that neither the wildfowl nor their food have disappeared from the Blackwater. Yachtmen's fears as to marine borers were unfounded. Herrings have now extended their spawning to upstream of the station in a area known to be warmed by the discharge. Experiences at other power stations, both fossil and nuclear fuelled, are mentioned. The authors maintain that to identify all warmed discharges as thermal pollution is incorrect. Thermal discharges can be planned so that the impact is minimal. (See also W76-08848) (Chilton-ORNL)
W76-08873

INFLUENCE OF HEAT FROM THE GENTILLY NUCLEAR POWER STATION ON WATER TEMPERATURE AND GASTROPODA, (INFLUENCE DE L'APPORT THERMIQUE ORIGINAIRE DE LA CENTRALE NUCLEAIRE GENTILLY SUR LA TEMPERATURE DE L'EAU ET SUR LES GASTEROPODES),
Quebec Univ., Trois-Rivieres.
G. Vaillancourt, and R. Couture.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974, p 449-459, 2 tab, 6 fig.

Descriptors: *Thermal pollution, *Environmental effects, Mollusks, Aquatic life, Temperature, Mortality, Canada, *Gastropods, *Water temperature, Water pollution effects.
Identifiers: Gentilly Nuclear Power Station(Canada).

The study reports on the effects of increased water temperature from the Gentilly Nuclear Power Station on the physical characteristics of the environment and on some species of mollusks. With the reactor operating at maximum power there is an increase of almost 10 degrees C in the water temperature. At these temperatures, mortality among the mollusks increases to the point that they disappear completely. With the reactor operating at 480 MW(th) the increase in water temperature is 3.5 degrees C in the discharge canal. (See also W76-08848) (Chilton-ORNL)
W76-08874

STUDIES CARRIED OUT IN FRANCE ON THE ECOLOGICAL CONSEQUENCES OF OPEN-CIRCUIT COOLING IN THERMAL POWER STATIONS, (ETUDES REALISEES EN FRANCE SUR LES CONSEQUENCES ECOLOGIQUES DE LA REFRIGERATION DES CENTRALES THERMIQUES EN CIRCUIT OUVERT),
Electricite de France, Chatou. Direction des Etudes et Recherches.
M. Khalanski.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 461-477, 8 fig, 1 tab, 23 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Aquatic life, Nuclear power plants, Water pollution effects.
Identifiers: *France.

The purpose of the work carried out in France under the auspices of Electricite de France to improve the knowledge of the influence of power-plant cooling on organisms in the aquatic environment is summarized. (See also W76-08848) (Chilton-ORNL)
W76-08875

BEHAVIOURAL RESPONSES OF LAKE MICHIGAN FISHES TO A NUCLEAR POWER PLANT DISCHARGE,
Argonne National Lab., Ill.
S. A. Spigarelli.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 479-498, 6 tab, 3 fig, 19 ref.

Descriptors: *Thermal pollution, *Environmental effects, Fish, Salmonids, Smelts, Fish behavior, Temperature, *Lake Michigan, Lakes.

The purpose of this research program was to define the behavior of free-swimming Lake Michigan fishes relative to thermal discharges such that effects studies would be based on actual rather than hypothetical conditions. Using echo location techniques, it was found that except during the spawning season of alewife and smelt when plume densities are higher than reference areas, that mean fish densities are similar in plume and reference areas. Little change in fish density or distribution was noticed during periods of power plant shutdowns. Based on body-temperature studies on trout and salmon, it was concluded that during most of the year, salmonids tended to thermoregulate rather than acclimate to discharge temperatures. Feeding temperatures of salmonids were generally intermediate between intake and discharge temperatures. During spawning seasons, trout and salmon periodically equilibrate to discharge temperatures but do not remain in the flumes for extended periods of time. (See also W76-08848) (Chilton-ORNL)
W76-08876

THERMAL EFFECTS ON MARINE BIOTA IN EXPERIMENTAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
G. Nilsen, and T. Kallqvist.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 499-518, 9 fig, 5 tab, 38 ref.

Descriptors: *Thermal pollution, *Environmental effects, Benthos, Aquatic life, Algae, Productivity, Photosynthesis, Laboratory tests.

The paper consists of two parts; a description of marine benthic communities in artificial channels and the measurement of carbon assimilation of natural phytoplankton at different temperatures in an incubator. A study of marine benthic algae indicated a significant change to green and blue-green dominated communities with increasing temperatures. The only significant difference in animal species between the channels was that Apherusa bispinosa was common in the unheated channel and not present in the heated channel. The effect of temperature on primary productivity was found to vary throughout the year although a 2.0 degrees C increase in temperature always stimulated production. In winter there was a tendency for productivity to increase with both a 2.0 and 6.0 degree C increase but not with a 4.0 degree C increase. In May and August, a 4.0 degree C increase was associated with higher production. (See also W76-08848) (Chilton-ORNL)
W76-08877

EFFECTS OF TEMPERATURE, COPPER AND CHLORINE ON FISH DURING SIMULATED ENTRAINMENT IN POWER-PLANT CONDENSER COOLING SYSTEMS,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Coastal Fisheries Center.
D. E. Hoss, L. C. Coston, J. P. Baptist, and D. W. Engel.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 519-527, 5 fig, 13 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Water pollution effects, Temperature, *Copper, *Chlorine, Fish, Larval growth stage, Mortality, Laboratory tests.

Entrainment conditions were simulated in the laboratory to investigate the effects of thermal shock alone, the combined effects of thermal shock and copper, and the combined effects of thermal shock and chlorine on the survival of larval fish. A cycling acclimation temperature was found to reduce the effects of thermal shock alone on the larval pinfish. When pinfish were subjected to shock temperatures of 12 to 15 degrees C above acclimation temperature and held in water containing 1.0 ppm of copper for 24 hours prior to thermal shock, the survival was significantly reduced. Striped mullet and flounder survived 5 min exposures to 0.3 ppm chlorine at ambient temperatures. Atlantic menhaden withstood exposures up to 7 min. Reductions in survical of mullet, flounder and menhaden occurred with longer exposures and still further reductions occurred with the addition of heat. In some cases, chlorine concentrations of 0.5 ppm caused still further reductions. The interaction between heat and chlorine appears to be synergistic. (See also W76-08848) (Chilton-ORNL)
W76-08878

EFFECTS OF HEAT ENRICHMENT ON SPECIES SUCCESSION AND PRIMARY PRODUCTION IN FRESH-WATER PLANKTON,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs; and Atomic Energy of Canada Ltd., Chalk River (Ontario). Biology and Health Physics Div.
J. W. McMahon, and A. E. Docherty.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 529-546, 8 fig, 2 tab, 16 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Plankton, Populations, *Primary productivity, Aquatic life, Chrysophyta, Chlorophyta, Diatoms, Rotifers, Oligotrophy, Water pollution effects, Canada.
Identifiers: Species diversity, *Lake Maskinonge(Canada).

Heat-enrichment experiments were carried out in polyethylene columns in temperate, oligotrophic Lake Maskinonge. A maximum temperature increase of 6 degrees C was obtained between the lake and the heated water in the experimental column. Thirty species of phytoplankton and seventeen species of zooplankton were quantitatively studied. In late spring, 3 Chrysophyceae and

2 Diatomae responded negatively to the heated water while 3 Rotifera increased significantly in numbers. In mid-summer a Chlorophyta was found in large numbers in the heated water. It was concluded that thermal enrichment, probably interacting with chemical, biological and physical factors, temporarily influenced the population density of certain species of plankton but there were no indications of permanent changes in diversity of species due to heat enrichment. (See also W76-08848) (Chilton-ORNL)
W76-08879

AQUATIC PHYSIOLOGY OF THERMAL AND CHEMICAL DISCHARGES,
Battelle Pacific Northwest Labs., Richland, Wash.
M. J. Schneider, C. D. Becker, D. H. Fickeisen, T. O. Thatcher, and E. G. Wolf.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 547-561, 8 fig, 2 tab, 14 ref. AT(45-1)-1830.

Descriptors: *Thermal pollution, *Environmental effects, Fish, Thermal stress, Fish behavior, Chemical wastes, Supersaturation, Water pollution effects.
Identifiers: *Environmental impact assessment.

The program is directed at ongoing research necessary for environmental impact assessment. Five areas are discussed; the effects of fatigue on thermal tolerance in fish, the behavioral response of fish influenced by thermal plumes and the effect of thermal experience on fish sensory physiology, the effects of gas supersaturation on fish, the effects of cold shock on fish, and the effects of heat and pollutant chemicals on fish. It was found that under certain combinations of thermal stress following periods of sustained swimming effort fish are significantly more susceptible to thermal stress and small fish are less tolerant than large fish. Evidence indicates that juvenile fish have reduced capacity to avoid predators following exposure at sublethal levels to heated water. Fish were provisionally ranked in the following order of increasing tolerance to gas supersaturation: mountain whitefish, rainbow trout, largescale sucker, channel catfish, black bullhead, bluegill, pumpkinseed, smallmouth bass, carp. Fish were found to be most tolerant to gas supersaturation when the water temperature is near the species optimum. (See also W76-08848) (Chilton-ORNL)
W76-08880

THERMAL ECOLOGY OF DRAGONFLIES IN HABITATS RECEIVING REACTOR EFFLUENT,
Savannah River Ecology Lab., Aiken, S. C.
J. B. Gentry, C. T. Garten, Jr., F. G. Howell, and M. H. Smith.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 563-574, 3 fig, 2 tab, 19 ref. AT(38-1)-310 & AT(38-1-819.

Descriptors: *Thermal pollution, *Environmental effects, *Dragonflies, Mortality, Habitat, Size, Growth stages, Water pollution effects.
Identifiers: Critical thermal maximum, Lethal temperature, Nymphs, Thermal tolerance.

Investigations showed that both the numbers of individuals and species of dragonfly nymphs were reduced when thermal effluent was received by streams and ponds. The only surviving genera belonged to the sub-family Libellulinae. Mortality was attributed directly to the effects of increased heat and indirectly to habitat alterations. Dragonfly nymphs from thermally stressed streams showed a higher thermal tolerance than nymphs from natural streams and this higher thermal tolerance was reflected by a higher critical thermal maximum and a higher lethal temperature at different acclimation temperatures. The significant variables in determining thermal tolerances were acclimation temperature, habitat, and body size. (See also W76-08848) (Chilton-ORNL)
W76-08881

TEMPERATURE SELECTION BY FISH--A FACTOR IN POWER-PLANT IMPACT ASSESSMENTS,
Oak Ridge National Lab., Tenn.
C. C. Coutant.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 575-597, 9 fig, 2 tab, 94 ref.

Descriptors: *Thermal pollution, *Environmental effects, Temperature, Fish, Fish behavior, Laboratory tests, On-site investigations.

This paper summarizes thermal preference and avoidance temperatures from the literature and presents result from field studies. Gizzard shad showed marked attraction in spring to heated effluent. The final preferendum for wild largemouth bass was found to be near 27 degrees C. The paper point out that accurate predictions of fish behavior near thermal discharges requires information on the general principles of fish responses, characteristic preferences exhibited by different species, the degree to which fish behavior in field situations differs from laboratory behavior, and the extent to which other factors modifies thermal preferences. (See also W76-8848) Chilton-ORNL)
W76-08882

PREDICTING THE ECOLOGICAL CONSEQUENCES OF THERMAL POLLUTION FROM OBSERVATIONS ON GEOTHERMAL HABITATS,
Wisconsin Univ. Madison, Dept. of Bacteriology.
T. D. Brock.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 599-622, 3 tab, 39 ref. C00-2161-19.

Descriptors: *Thermal pollution, *Environmental effects, *Geothermal studies, Habitats, Limiting factors, Aquatic life, Temperature, Mortality, Forecasting, Water pollution effects.

Geothermal habitats which are natural, stable and of long duration are used as a basis for deriving a set of general principles for predicting the ecological consequences of thermal pollution. Upper temperature limits for various organisms are given as follows: aquatic vertebrates, 38 C; insects, 45-50 C; protozoa, 50 C; vascular plants, 45 C; mosses, 50 C; eucaryotic algae, 56 C; fungi, 60 C; blue-green algae, 70-73 C; bacteria, 99 C. Restrictions in species diversity may be seen at temperatures below the upper limits for these organisms. (See also W76-08848) (Chilton-ORNL)
W76-08883

A COMPARISON OF SHORT-TERM EFFECTS OF THERMAL ADDITION ON PHOTOSYNTHESIS AND PLANT-WATER STRESS IN THREE ECOSYSTEMS,
San Diego Univ., Calif. Dept. of Biology.
P. C. Miller.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 623-636, 7 fig, 1 tab, 19 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Photosynthesis, Stress, Mangrove swamps, Tundra, Chaparral, Primary production, Model studies, Ecosystems, Alaska, California, Florida, *Primary productivity.
Identifiers: *Water stress(Plants).

This paper compares some potential short-term responses of primary production and plant water stress to thermal additions in three diverse ecosystems: the coastal arctic tundra near Barrow, Alaska; the chaparral in San Diego County, California; and the red mangroves in southern Florida. A simulation model was used to make the comparisons. Of the three systems studied, the mangroves showed the greatest changes in primary production with changing temperatures but the chaparral showed the greatest changes in water stress. (See also W76-08848) (Chilton-ORNL)
W76-08884

DEVELOPMENT AND APPLICATION OF CRITERIA FOR MARINE COOLING WATERS,
Environmental Research Lab., Narragansett, R. I.
For primary bibliographic entry see Field 5G.
W76-08885

REGULATIONS AND ENVIRONMENTAL INVESTIGATIONS ASSOCIATED WITH NUCLEAR STATION THERMAL DISCHARGES,
Ente Nazionale per l'Energia Elettrica, Rome (Italy). Direzione della Costruzioni.
For primary bibliographic entry see Field 5G.
W76-08886

CAN THE CRITERIA AND METHODOLOGY USED FOR RADIOACTIVE DISCHARGES BE APPLIED TO THERMAL DISCHARGES. (LES CRITERES ET LA METHODOLOGIE RETENUS POUR LES REJETS RADIOACTIFS SONT-ILS TRANSPOSABLES AUX REJETS THERMIQUES.),
CEA Centre d'Etudes Nucleaires de Fontenay-aux Roses (France). Departement de Protection.
For primary bibliographic entry see Field 5G.
W76-08887

COMPARATIVE EFFECTS OF TWO MODES OF COOLING WATER DISCHARGE ON MISSISSIPPI RIVER BIOTA AND ENVIRONMENTAL ECOSYSTEMS,
Industrial Bio-Test Labs. Northbrook, Ill. Environmental Sciences Div.
H. O. Eiler, and J. J. Delfine.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 685-692, 3 fig, 10 ref.

Descriptors: *Thermal pollution, *Environmental effects, Engineering structures, Cooling water, Mississippi River.
Identifiers: Cooling systems.

The environmental impact of two different modes of once-through cooling systems are assessed. The interim side-jet discharge mode clearly had an adverse impact on a localized, but biologically productive area because of thermal and chemical (chlorine) stresses. The diffuser-pipe system provided an alternative method for discharging heated waste water in this particular river environment. The efficiency of the diffuser-pipe mode of discharge in rapidly mixing the heated effluent with river water relieved the local island ecosystem of thermal and chemical stresses and resulted in a complete recovery of this previously affected area. (See also W76-08848) (Chilton-ORNL)
W76-08888

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W76-08889

TOXICITY STUDY - DRILLING FLUID CHEMICALS ON AQUATIC LIFE,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.

C. K. Grantham, and J. P. Sloan.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 103-110, 6 tab, 11 ref.

Descriptors: *Drilling fluids, *Toxicity, Aquatic life, Wells, Water pollution effects.
Identifiers: *Weighting materials, *Barite, *Calcite, *Siderite, Mollenisias Latipinna.

Compounds used to weight drilling fluids are naturally occuring minerals found in every living creature. Barite accounts for 98 percent of all weighting agents used worldwide. The high specific gravity (4.2), abundance, and relative chemical inertness makes barite an ideal weighting material. Calcite is in limited use today because of the mineral's low specific gravity (2.7). It is most often used in workover or completion fluids for normally pressured formations. Its complete solubility in hydrochloric acid suits it well for this application. Within the last 2 years, siderite has been introduced as an acid soluble weighting material. Siderite is used with calcite and sometimes as a substitute because of its higher specific gravity (3.8). An analysis of barite, calcite and siderite showed that each was inert and exhibited no appreciable water solubility. Barite, calcite and siderite are routinely used as medicinal compounds for human consumption. Toxicity tests of these three additives were conducted using Mollienisias Latipinna (mollies). Concentrations up to 100,000 parts per million and tests periods up to 96 hours were used. The fish toxicity test concludes that concentrations up to 100,000 parts per million introduced into fresh or sea water do not constitute a toxic environment. Therefore, it can also be concluded that use of these weighting materials in drilling fluids do not constitute the introduction of a toxic substance in the environment. (See also W76-08889) (Heiss-NWWA)
W76-08895

FISH TOXICITY OF DISPERSED CLAY DRILLING MUD DEFLOCCULANTS,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
J. W. Hollingsworth, and R. A. Lockhart.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 113-123, 3 fig, 1 tab, 4 ref.

Descriptors: *Drilling fluids, *Clays, *Toxins, *Fish toxicity, Phosphates, Montorillionite, Lignite.
Identifiers: *Clay deflocculation, Tannins, Lignosulfonates, Mollienisias latipinna.

Thinning agents are used in drilling fluids to deflocculate clay particles and maintain proper gel strengths. Phosphate thinners are limited to low temperatures (below 200 degrees Farenheit) and to fresh water applications because of their tendency to revert to orthophosphates. Tannin compounds are acidic organic substances extracted from certain plants. Tannin agents require a high pH for optimum performance and lack thermal stability; however, their electrolyte contamination tolerance is superior to the phosphate compounds. Lignite for treating drilling mud is high in humic acid content and caustic solubility. Lignite drilling muds demonstrate extreme thermal stability, however, they are also subject to electrolyte sensitivity. Lignosulfonates are the most widely used thinning agents available today due to their -xcellent electrolyte tolerance, pH range, and thermal stability. Toxicity test of these compounds conducted with Mollienisias Latipinna demonstrated that the tannin class has a considerably lower median tolerance level than any of the other thinners. (See also W76-08889) (Heiss-NWWA)
W76-08896

EFFECT OF DRILLING FLUID COMPONENTS MIXTURES ON PLANTS AND SOILS,
Utah State Univ., Logan. Dept. of Soil Chemistry.
R. W. Miller, and S. Honarvar.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 125-143, 7 tab, 16 ref.

Descriptors: *Drilling fluids, *Toxicity, *Sweet corn, *Beans, Growth rates, Soils, Plant growth.
Identifiers: *Drilling fluid additives.

Thirty-one drilling fluid additives were tested for their effects in reducing plant growth. Greenbeans and sweet corn were used as test plants. The soil was a slightly acidic silt loam. Each component was tested at a high and low concentration rate. The low rates were typical of concentrations used in the field. Bean yield increase resulted from normal (low concentration) use rates of asbestos, VAMA (a copolymer of vinyl acetate and maleic anhydride) and sodium dichromate. No reduction of plant yield occurred in soil at normal use rates with asphalt, barite, bentonite, calcium lignosulfonate, sodium polyacrylate, a modified tannin (Desco), a nonfermenting starch, ethoxylaten monyl phenol (*DME); a filming amine, gilsonite, a xanthan gum, pyrophosphate, sodium carboxymethyl cellulose, sodium hydroxide, a sulfonated tall oil, and a sulfonated triglyceride (Torg-Trim). Significant reduction in yield at normal use concentrations resulted from diesel oil, large alcohol, guargum, a plant-synthetic fiber mix (Kwik-seal), lignite, potassium chloride, pregelatinized starch, a modified asphalt (Soltex) and iron chromeligno sulfonate. When individual components were mixed, slight growth reductions occurred with sodium dichromate and plant fiber mix. Higher application rates had greater reduction of plant growth. However, these rates are not typical of normal use. (See also W76-08889) (Heiss-NWWA)
W76-08897

ACUTE TOXICITY OF WELL-DRILLING TO RAINBOW TROUT,
Environmental Protection Service, Edmonton (Alberta). Aquatic Toxicology Lab.
For primary bibliographic entry see Field 5A.
W76-08899

ENVIRONMENTAL CONDITIONS AND PRODUCTIVITY IN THE TERMINOS LAGOON, CAMPECHE, MEXICO, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W76-08900

TOXICITY AND ENVIRONMENTAL PROPERTIES OF CHEMICALS USED IN WELL-DRILLING OPERATIONS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
V. Zitko.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 311-326, 1 fig, 9 tab, 31 ref.

Descriptors: *Drilling fluids, *Toxicity, Inorganic compounds, Organic compounds, Aquatic life, Oil wells, Chromium, Surfactants, Polymers, Oysters, Bactericides, Clams, Plankton, Herring.
Identifiers: Barite, Amines, Imidazolines, Seaweed.

Under normal conditions the most pronounced detrimental effects on the environment are caused by the physical action of suspended solids from drilling fluids. High molecular weight organic constituents are relatively nontoxic. The molecular weight constituents have toxicities ranging from high to relatively low and it may be possible to select the chemically satisfactory compounds that are not toxic. The same may be true about surfactants. The effects of high temperature drilling environments on organic additives is still largely unknown. The degradation products of these additives could have higher toxicity than the parent material. The petroleum fractions or tar contained in some drilling fluids have been extensively documented. It is obvious from this literature that discharge of these substances should be as limited as possible. (See also W76-08889) (Heiss-NWWA)
W76-08906

POTENTIAL EFFECTS OF OIL DRILLING AND DUMPING ACTIVITIES ON MARINE BIOTA,
North Carolina Univ. at Wilmington. Inst. of Marine Biomedical Research.
R. Y. George.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 333-355, 7 fig, 3 tab, 27 ref.

Descriptors: *Offshore platforms, *Oil wells, *Environmental effects, Sediment discharge, *Drilling fluids, Marine animals, *Absorption, *Water pollution, Continental shelf, Louisiana, Shrimp, Algae, Turbidity, *Oil spills.
Identifiers: Drilling fluid components, Drilling discharges, Barnacles, Louisiana Continental shelf, Timbalier Bay (La).

There exists a gap in our knowledge on the impact of drilling mud components on marine biota and of the chronic effects of oil spillage on both plants and animals in the marine environment. On the basis of results recently obtained in offshore ecological investigations on the Louisiana Continental Shelf, efforts are being made to evaluate the extent of the effects of drilling activity on the marine ecosystem. Biological implications of the potential effects of drilling discharge are examined under four parameters associated with offshore drilling: (1) the 'burial effect' on the sea floor benthos caused by discharge of drilling mud components, (2) the possible accumulation or magnification in the food chain of discharge drilling mud components, (3) influence of turbidity-plumes of drilling mud on the filter-feeding organisms, (4) the acute and chronic effects of crude oil spillage on marine biota. (See also W76-08889) (Heiss-NWWA)
W76-08907

NOTES ON THE IMPORTANCE OF DISSOLVED AND PARTICULATE ORGANIC MATTER IN MARINE FOOD CHAINS, (IN SPANISH),
Universidad de Oriente, Cumana (Venezuela). Inst. of Oceanography.
C. Flores.
Lagena. 31. p 27-34. 1973.

Descriptors: *Food chains, Microorganisms, Crustaceans, Gastropods, *Ecosystems, Marine Biology, Chemical properties, Physical properties.

Studies on the formation, physicochemical properties and interrelationships of organic aggregates, fecal materials, detritus, bacteria and protozoa in the complex network of marine food chains are reviewed. Besides microorganisms the role of crustaceans and gastropods as consumers and producers was examined. The threat of environmental pollution to the delicate balance of the marine ecosystem is mentioned.--Copyright 1976, Biological Abstracts, Inc.
W76-08916

PHYSIOLOGICAL EFFECTS OF SUBLETHAL LEVELS OF ACID WATER ON FISH,
West Virginia Univ., Morgantown. Water Research Inst.
W. J. Pegg, and C. R. Jenkins.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 958, $4.50 in paper copy, $2.25 in microfiche. Bulletin 6, (WRI-WVU-76-01), 1976. 47 p, 10 fig, 10 tab, 55 ref. OWRT A-016-WVA(1), 14-31-0001-3049.

Descriptors: *Acid mine water, Fish, *Fish physiology, *Metabolism, *Oxygen requirements,

*Respiration, *Water pollution effects, Acidic water, Biochemical oxygen demand, Biochemistry, *Bullheads, Environmental effects, Freshwater fish, Oxygen demand, *Sunfishes, Toxicity, Lethal limit.
Identifiers: Physiological effects, Physiological stress.

Oxygen-consumption rates as milligrams of oxygen per gram of fish per hour (mg 02/g per hr) were measured in a flow-through respirometer for bluegill sunfish, Lepomis macrochirus Rafinesque; pumpkinseed sunfish, Lepomis gibbosus (Linnaeus); and brown bullheads, Ictalurus nebulosus (LeSueur). Non-stress standard oxygen-consumption rates were established using tap water. Oxygen-consumption rates in acid waters were established for I. nebulosus using tap water acidified with sulfuric acid and constituted water acidified with coal-mine drainage. Oxygen-consumption rates in acid waters for L. macrochirus and L. gibbosus were established using constituted water acidified with sulfuric acid or acid-mine drainage. L. macrochirus exhibited a decrease in mean oxygen-consumption rates in acid water - 0.081 mg 02/g per hr compared to 0.111 in tap water. L. gibbosus exhibited increased oxygen-consumption rates in acid water - 0.106 mg 02/g per hr compared to 0.082 in tap water. I. nebulosus exhibited lower oxygen-consumption rates in acid water than in tap water - 0.075 mg 02/g per hr compared to 0.124. In acid water (pH 4.0-3.0), ventilation rates were highly variable and frequently increased to three times the standard resting rate. As an indication of physiological stress, the changes in oxygen-consumption rate in acid waters compared to standard tap water were significant for each fish species.
W76-08927

A METHOD FOR ESTIMATING THE TOXICITY OF CHLORINATED DISCHARGES,
Oak Ridge National Lab., Tenn.
J. S. Mattice.
In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments, EPRI SR-38, Special Report Vol. II, p 142-155, April 1976, 3 fig, 2 tab, 20 ref.

Descriptors: *Environment effects, *Aquatic life, Thermal powerplants, *Chlorine, Mortality, *Pollutant identification, Analytical techniques, *Toxicity, Estimating.

A recently developed procedure is described for site specific analysis of chlorine toxicity both within a facility and its discharge. It involves setting toxicity thresholds and then comparing dose-times, (1) within the plant, and (2) within the discharge, with the thresholds. The data represent 64 species. The thresholds indicated that for concentration greater than 0.0015 mg/l increase in time of exposure generally increases the toxicity of chlorine. For concentrations less than 0.0015 mg/l, toxicity is no longer time-dependent and exposure for infinite time would not result in death from the effects of chlorine. (Chilton-ORNL)
W76-08928

GLYCEROPHOSPHATIDE CONTENT AND COMPOSITION OF TROUT (SALVELINUS FONTINALIS M.) BRAIN,
Toronto Univ. (Ontario). Dept. of Zoology and Erindale Coll. (Ontario).
W. Driedzic, and B. I. Roots.
Journal of Thermal Biology, 1975, Vol. 1, Pergamon Press, p 7-10, 2 tab, 26 ref.

Descriptors: *Biochemistry, Lipids, *Trout, Temperature.
Identifiers: Acclimation temperature, Salvelinus fontinalis M., *Glycerophosphatide.

The amounts and composition of diacylglycerophosphatidyl, alk-l-enylacylglycerophosphatidyl choline, dialcylglycerophosphatidyl ethanolamine and alk-l-enylacylglycerophosphatidyl ethanolamine in the brain of trout which had been acclimated to temperatures of 5 degrees C and 19 degrees C were determined. At both acclimation temperatures the diacylglycerophosphatidyl choline was present in the greatest amount and the alk-l-enylacylglycerophosphatidyl choline in the least amount. Plasmalogen was the same at both acclimation temperatures and all of it was ethanolamine based. An increase in the proportion of long chain polyunsaturated fatty acids was found in the GPE fraction at the lower temperature. (Chilton-ORNL)
W76-08929

THE EFFECT OF THERMAL POLLUTION ON THE DISTRIBUTION OF NAEGLERI FOWLERI,
Louvain Univ. (Belgium). Laboratorie de Hygiene; and Louvain Univ. (Belgium). School of Public Health.
J. De Jonckheere, P. Van Dijick, and H. van de Voorde.
The Journal of Hygiene, Vol 75, No. 1, p 7-13, August, 1975, 1 fig, 1 tab, 17 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Distribution, Microorganisms, Diseases.
Identifiers: Amoebae, *Naegleri fowleri, Meningoincephalitis.

The study investigates the distribution in the environment of Naegleri fowleri, the causative agent of primary amoebic meningoencephalitis. Sampling from two canals, a stream, two lakes, several reservoirs and slow sandfilters of a water supply service and also a water distribution network resulted in the Naegleri fowleri being found in only one of the two thermally polluted canals and being absent from all the other locations. This indicates that factors other than high temperatures are involved in the selective proliferation of N. fowleri. Most of the strains isolated were not virulent for mice, although they showed all the characteristics of the pathogenic strains. Other amoebae able to grow at 42 degrees C were found in the sampling locations. (Chilton-ORNL)
W76-08930

FEEDING BEHAVIOR AND TEMPERATURE AND LIGHT TOLERANCE OF MYSIS RELICTA IN THE LABORATORY,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
G. M. DeGraeve, and J. B. Reynolds.
Transactions of the American Fisheries Society, Vol. 104, No. 2, p 394-397, 1975. 2 fig, 7 ref.

Descriptors: *Environmental effects, *Temperature, *Light intensity, Laboratory tests, *Shrimp.
Identifiers: Feeding behavior, *Mysis relicta.

The limits of tolerance of the opossum shrimp, Mysis relicta, to light and temperature were studied in the laboratory over a period of one year. As food particles or brine shrimp drifted downward, the mysids moved from 1 to 5 cm horizontally in rapid, jerking motions to intercept them. Individuals in covered containers exhibited the same movement when the cover was removed, whether fed or not. A more continuous and passive method of feeding was that of swimming upside down and gathering floating particles from the surface. Scavenging was frequent in a container from which dead mysids were not removed. Movement and feeding increased noticeably at 15-16 degrees C but stress was not visibly evident until temperatures reached 20-21 degrees C. Data from light tolerance tests showed that, after 38 weeks, survival was 32.5% in continuous full light as compared with 44.6% in subdued light. (Chilton-ORNL)
W76-08931

THE BIOLOGY OF THE LEECH MYZOBDELLA LUGUBRIS INFESTING BLUE CRABS AND CATFISH,
Charleston Coll., S. C. Dept. of Biology; and Charleston Coll., S. C. Grice Marine Biological Lab.
B. A. Daniels, and R. T. Sawyer.
Biological Bulletin, Vol. 148, p 193-198, April, 1975. 1 fig, 1 tab, 16 ref.

Descriptors: *Biological communities, Population, Aquatic populations, Seasonal, Hosts, Fish, Crustacean, *Crabs, *Catfishes.
Identifiers: *Leeches, *Myzobdella lugubris.

To establish the seasonal abundance of M. lugubris, a population was examined at monthly intervals from May, 1972 through April, 1973 in the middle reaches of the Ashley River. The Ashley River is tidal along most of its reach with a salinity range from 0 to 14% and a temperature range from 4 to 29 degrees C. Throughout the year and especially in October and November, leeches were found on the carapace of the blue crab. It appeared that the crab carapace normally served as a site for the deposition of the leech cocoons. The peak of cocoon deposition occurs during the summer months. 70% of the catfish examined were infested with leeches. The seasonality of infestation was corroborated by a strong negative correlation between water temperature and the average number of leeches per catfish as well as the temperature and the catfish infestation rate. The greatest increase in the leech population occurred in December. (Chilton-ORNL)
W76-08932

ENVIRONMENTAL AND INTRINSIC CONTROL OF FILTERING AND FEEDING RATES IN ARCTIC DAPHNIA,
State Univ. of New York at Albany. Dept. of Biological Sciences.
S. W. Chisholm, R. G. Stross, and P. A. Nobbs.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 2, p 219-226, February 1975, 5 fig, 2 tab, 29 ref.

Descriptors: Daphnia, Water pollution effects, *Environmental effects, *Feeding rates, Food abundance, Diurnal, Size, *Alaska, Temperature, Arctic.
Identifiers: Pt. Barrow(Alas).

Filtering rates of the Daphnia middenderffiana population were measured as a function of food concentration at a temperature of 11 degrees C. Feeding rates calculated from the data were found to be a hyperbolic function of food density and filtering rate was characteristically inhibited at the higher densities. Maximum filtering rate was near 12 degrees C for all age-groups. Filtering rate increases with animal length. For animals held under constant conditions the feeding rates were maximum at 1400 and 2400 hours, the time of day when the temperature cycle in natural ponds passes through the mean daily temperature. (Chilton-ORNL)
W76-08933

TEMPERATURE INFLUENCE ON CHEMICAL TOXICITY TO AQUATIC ORGANISMS,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Center for Environmental Studies.
J. Cairns Jr, A. G. Heath, and B. C. Parker.
Journal Water Pollution Control Federation, Vol. 47, No. 2, p 267-280, February 1975, 2 fig, 87 ref. EPA 303657-1 EPA68-01-1817

Descriptors: *Environmental effects, *Water pollution effects, *Temperature, *Toxicity, Fish, Fishkill, Chemical reactions.
Identifiers: Fish toxicity.

General trends on physiological mechanisms in toxicant-temperature interactions are indicated. Survival time of fish in toxic concentrations of ammonia decreases markedly with a rise in tempera-

ture. Threshold concentrations for cyanide apparently vary only slightly with temperature changes but a 20 degree C difference in temperature caused a reduction in survival time by a factor of 2 to 7. Data showed that a changing thermal environment, in contrast to a constant one, may magnify effects of trace metal toxicity to fish. Toxicity of pesticides and herbicides vary with individual compounds. Phenols appear to be most damaging under winter conditions. Elevated temperatures that would lower dissolved oxygen and increase the respiratory demand for oxygen would probably increase the toxicity of chlorine to fish. (Chilton-ORNL)
W76-08934

RESEARCH ON THE MARINE FOOD CHAIN.
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
J. Cairns, Jr., A. G. Heath, and B. C. Parker.
UCSD 10 p 20-202, 1975, 912 p. UCSD Progress Report for the period July 1974 - June 1975. AT(11-1)GEN 10, P. A. 20.

Descriptors: *Projects, *Programs, *Food webs, *Food chains, California, Pacific Ocean, Water pollution effects, Eutrophication, Path of pollutants.
Identifiers: Fish toxicity.

Research activity by Food Chain Research Group covers a broad range of interests centered around the study of the organisms comprising the lower levels of the marine pelagic food web and their chemical and physical environments. Part I of the report contains short accounts of projects in progress. Part II consists of reports on completed research in manuscript form. Part III provides narrative accounts of recent cruises where Food Chain Research Group members served as chief scientists. (See W76-08936 thru W76-08961) (Chilton-ORNL)
W76-08935

PHYSIOLOGICAL ECOLOGY OF GONYAULAX POLYEDRA, A RED WATER DINOFLAGELLATE OFF SOUTHERN CALIFORNIA,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. W. Eppley, and W. G. Harrison.
In: Research on the Marine Food Chain, Progress Report UCSD 10P20-202, for the period July 1974-June 1975. p 207-221, 1 fig, 2 tab, 31 ref.

Descriptors: *Red tide, *Dinoflagellates, *Physiological ecology, Thermocline, Upwelling, Nutrients, Migration patterns, Diel migration, Vertical migration, Nuisance algae.
Identifiers: Gonyaulax polyedra.

Physiological measurements of Gonyaulax polyedra, a dominant species in red tides off the coast of southern California, have been carried out since the 1950's. These measurements include studies of bioluminescence and the periodicity of cell division, diel vertical migration, proximate chemical composition, and nitrogen assimilation. Nutrient enrichment from upwelling appears to be the causative mechanism in the California red tides. Dinoflagellate blooms are associated with steep, shallow thermoclines, a nutrient-depleted, shallow mixed layer but with nutrient-rich water below the shallow thermocline and within the depth range of the diurnal verticle migration of the dinoflagellates. When these physical conditions prevail, the vertical migration along with certain idiosyncracies in their metabolism of nitrogen provide an advantage for the dinoflagellates over other species. (See also W76-08935) (Chilton-ORNL)
W76-08936

TWO BLOOMS OF GYMNODINIUM SPLENDENS (LEBOUR). A LARGE NAKED DINOFLAGELLATE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
D. A. Kiefer, and R. Lasker.
In: Research on the Marine Food Chain, Progress Report UCSD 10P20-202, for the period July 1974-June 1975. p 223-235, 2 fig, 1 tab, 17 ref.

Descriptors: *Dinoflagellates, *Aquatic algae, *Eutrophication, Coasts, California, Distribution patterns, *Food chains.
Identifiers: Bahia Consepcion, Southern California Bight.

Two blooms of Gymnodinium splendens (Lebour) were observed, one in Coyote Bay of Bahia Concepcion and the other along the coast of the Southern California Bight. In Coyote Bay chemical and physical observations were made while the ship was at anchor in 20 m of water. The depth distribution of the phytoplankton was recorded at regular intervals. Surface seas were calm and the thermal character of the water column remained constant. At sunset, the cells began a downward migration at a rate of approximately 1.7 m/hr. Before sunrise the next day, G. Splendens began an upward movement from a depth of 15 to 18 m. Information on the steady state doubling time for the species was determined to be 2.3 days. In the observation in the Southern California Bight, the G. splendens were most abundant at depths of 15 to 20 m. The subsurface layer formed a narrow, inshore band which appeared to extend over 100 km along the coast. Feeding experiments have indicated that G. splendens provide an ideal food source for marine herbivores. (See also W76-08935) (Chilton-ORNL)
W76-08937

PHOSPHATE UTILIZATION BY AN OCEANIC DIATOM IN PHOSPHORUS-LIMITED CHEMOSTAT CULTURE AND IN THE OLIGOTROPHIC WATERS OF THE CENTRAL NORTH PACIFIC,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. J. Perry.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202, p 237-300, 8 fig, 9 tab, 79 ref.

Descriptors: *Phytoplankton, *Phosphates, Cultures, Nitrogen, Oligotrophy, Pacific Ocean, Nutrient requirements, Deficient elements, *Diatoms.
Identifiers: Thalassiosira pseudonana.

Cells of Thalassiosira pseudonana were grown in a phosphorus-limited chemostat culture and in a nitrogen-limited chemostat culture and the chemical composition of the cells, expressed as ratios, were compared. These ratios varied in excess of a factor of 5 between the two systems and emerged as diagnostic indicators of phosphorus-starvation vs. nitrogen-deficiency. The data suggests that nitrogen is more limiting to marine phytoplankton growth rate than phosphorus. However, results indicate that phosphorus is involved with nitrogen in controlling the growth rate of the phytoplankton in the Central North Pacific Ocean. (See also W76-08935) (Chilton-ORNL)
W76-08938

DYNAMICS OF PHOSPHORUS CYCLING IN THE EUPHOTIC WATERS OF THE CENTRAL NORTH PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. J. Perry, and R. W. Eppley.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202. p 301-352, 1 fig, 12 tab, 67 ref.

Descriptors: *Nutrient requirements, *Phytoplankton, *Phosphorus, Nitrogen, Growth rates, Productivity, Pacific Ocean, Euphotic zone, Phosphates, *Cycling nutrients.

Phosphorus utilization by phytoplankton was assessed from P 33-phosphate uptake measurements with attention being given to the role of arsenate, the effect of low ambient levels of nitrogenous nutrients, and the size distribution of organisms taking up phosphate. The assimilation ratios of phosphate, carbon and ammonium- and urea-nitrogen deviated from predicted ratios for balanced growth but did not conform to expected values for either phosphorus-limited or nitrogen-limited growth. The ratios reflected aspects of both phosphorus and nitrogen limitation. The complementarity observed between nitrogen and phosphorus with respect to turnover times of the external pools, growth rates and nutrient budgets suggests that the growth rate and production are not limited by a single nutrient but rather that phosphorus and nitrogen together regulate growth rate and production and cycle through the food web as a balanced couple. (See also W76-08935) (Chilton-ORNL)
W76-08939

PHOTOSYNTHETIC MEASUREMENTS IN THE CENTRAL NORTH PACIFIC: THE DARK LOSS OF CARBON IN 24-HOUR INCUBATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. W. Eppley, and J. H. Sharp.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 353-379, 3 fig, 4 tab, 26 ref.

Descriptors: *Photosynthesis, *Phytoplankton, *Pacific Ocean, Growth rates, Respiration, Primary productivity, Measuremment.

Half-day and 24 hour incubations of phytoplankton with C 14 labelled bicarbonate gave similar values for net primary production in the central gyre of the North Pacific. Phytoplankton specific growth rates are much higher in cultures and coastal waters. Comparisons of half-or full-light day with 24 hour C 14 incubations provided estimates of the nightime C 14 loss. Phytoplankton respiration appears to be a principal source of the dark C 14 less, partly due to the lack of isotopic equilibrium expected if incubations are only 24 hours and phytoplankton doubling times are several days. The authors conclude that the 24 hour C 14 measurements represent not only phytoplankton uptake and respiration of C 14 but also the grazing and subsequent respiration of herbivores included in the samples. The phytoplankton would be expected to suffer some non-grazing mortality resulting in their mineralization by bacteria and other saprophytic heterotrophs. (See also W76-08935) (Chilton-ORNL)
W76-08940

SILICIC ACID UPTAKE AND INCORPORATION BY NATURAL MARINE PHYTOPLANKTON POPULATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
F. Azam, and S. W. Chilholm.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 381-405, 5 fig, 32 ref.

Descriptors: *Photosynthesis, *Nutrient requirements, *Phytoplankton, Pacific Ocean, Silica, Diatoms, Gulfs, Mexico.
Identifiers: *Gulf of California.

Ge68-Germanic acid was used as a tracer to study the uptake and incorporation of silicic acid by natural phytoplankton in the Gulf of California. The technique allowed very small silicic acid incorporation rates to be measured. The incorporation was light dependent with the rate of incor-

poration in the dark being only 44% of that at light saturation. In some cases, enrichment with silicic acid caused stimulation of photosynthetic carbon fixation. The techniques presented should facilitate investigations on the dynamics of diatom distribution patterns and species succession. (See also W76-08935) (Chilton-ORNL)
W76-08941

PRIMARY PRODUCTION AND THE FACTORS CONTROLLING PHYTOPLANKTON GROWTH IN THE ANTARCTIC SEAS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
O. Holm-Hansen, S. Z. El-Sayed, G. A. Franceschimi, and R. Cuhel.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10p20-202, p 407-471, 20 fig, 5 tab, 44 ref.

Descriptors: *Food chains, *Primary productivity, *Growth rates, *Phytoplankton, *Antarctic Ocean, Algae, Temperature, Nutrient requirements, Light, Respiration, Photosynthesis, *Plant growth.

The rate of primary production and the factors controlling phytoplankton growth rates were investigated on a north-to-south transect in subtropical, subantarctic polar front and antarctic water mass. Observed algal growth rates in Antarctic waters were 0.05 to 0.33 doublings per day as compared to some temperate or tropical phytoplankton with measured growth rates of over 1.0 doubling per day. In each of the north-south transects there were many variables to be considered in regard to phytoplankton growth rates. These parameters include temperature, nutrients, light intensity, respiratory rates, settling rates of cells, water column stability, and losses due to zooplankton grazing. (See also W76-08935) (Chilton-ORNL)
W76-08942

ASSAY OF NITRATE REDUCTASE FROM PLASMOLYZED MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. G. Harrison.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10p20-202, p 473-483, 1 tab, 6 ref.

Descriptors: *Food chains, *Analytical techniques, *Enzymes, Assay, Separation techniques, *Pollutant identification, *Bioassay.

Conventional techniques for nitrate reductase assays involve extraction by some form of mechanical cell distribution. The plasmolysis technique averaged over 5 times the values obtained by conventional methods. The plasmolysis procedure is most valuable in laboratory culture work and particularly for selected species where recovery of the enzyme is very high. The procedure has advantages of requiring only a fraction of the material needed for extraction procedures, it requires less work and equipment, and can be run in 1/3 the time. Considerable variation in plasmolysis/extraction enzyme activity ratios may limit the utility of the plasmolysis assay in studies of nitrate reductase for natural seawater samples with mixed populations. (See also W76-08935) (Chilton-ORNL)
W76-08943

A THERMODYNAMIC MODEL FOR STEADY STATE METABOLISM OF PHYTOPLANKTON, PART I. THEORY,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
D. A. Kiefer, E. Stewart, and T. Enns.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10p20-202, p 487-510, 2 fig, 2 tab, 19 ref.

Descriptors: *Model studies, *Metabolism, *Phytoplankton, Biochemistry, Mathematical models, *Chlorella.
Identifiers: Thermodynamic model(Phytoplankton).

A model of photoautotrophic growth of phytoplankton is presented and utilizes principles of nonequilibrium thermodynamics. The many biochemical reactions of the cell are classified into two pairs of coupled reactions; one describing primary photochemistry and the other describing all remaining biochemical reactions. By assuming steady state conditions and the applicability of phenomenological equations it was possible to quantitatively describe the rates of the two pairs of coupled reactions in terms of the chemical affinities of the reaction and their conductivity coefficients. By combining the equations with observation on optimal growth in Chlorella, it was possible to estimate the efficiency of energy conversion and the degree of coupling for both pairs of coupled reactions. (See also W76-08935) (Chilton-ORNL)
W76-08944

A THERMODYNAMIC MODEL FOR STEADY STATE METABOLISM OF PHYTOPLANKTON, PART II. LIGHT AND CARBON LIMITED GROWTH,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
D. A. Kiefer.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10p20-202. p 511-535, 8 fig, 17 ref.

Descriptors: *Model studies, *Photosynthsis, *Phytoplankton, Metabolism, Light, Carbon, Growth rates, *Chlorella.
Identifiers: Thermodynamic model(Phytoplankton).

A thermodynamic model of photosynthetic growth is applied to metabolic regulation in light and carbon limited phytoplankton. The model predicts responses in growth rate, cellular chlorophyll content, in vivo enzymatic activity and quantum efficiency of photosynthesis. The model assumes that the biochemical system is near equilibrium and reversible, that the basic pathways leading to cell growth are characterized by degrees of coupling which remain constant at different rates of steady state growth, and that the biochemical system is regulated so that the overall efficiency of conversion is maximal. Predictions compared favorably with observed regulation by Chlorella in the case of light limitation. (See also W76-08935) (Chilton-ORNL)
W76-08945

CHLORINE REACTIONS WITH SEAWATER CONSTITUENTS AND THE INHIBITION ON PHOTOSYNTHESIS OF NATURAL MARINE PHYTOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. W. Eppley, E. H. Renger, and P. M. Williams.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 537-574, 8 fig, 6 tab, 25 ref.

Descriptors: *Environmental effects, *Photosynthesis, *Phytoplankton, Sea water, Chlorine, Inhibition, Inhibitors, Chemistry.

Hypochlorite was added to seawater in the laboratory and in field samples collected adjacent to an open coast marine outfall of an electric generating station. Concentrations required for 50% phytoplankton photosynthesis inhibition varied with exposure time. 24 hour incubations required concentrations of about 10 ppb residual chlorine. There was no recovery of photosynthetic activity after chlorine had fallen to undetectable levels. Hypochlorite reacts rapidly with the bromide ion in seawater to form hypobromous acid and hypobromite and it is thought that these compounds along with residual bromine are the physiologically active substances formed on the chlorinating of seawater. (See also W76-08935) (Chilton-ORNL)
W76-08946

EFFECTS OF COPPER ON NATURAL MARINE PHYTOPLANKTON COMMUNITIES,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
O. Holm-Hansen, W. H. Thomas, D. L. R. Seibert, and M. Takahashi.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 575-591, 5 fig, 13 ref.

Descriptors: *Environmental effects, *Biological communities, *Phytoplankton, *Copper, Diatoms, Trophic levels, Populations, Water pollution effects.
Identifiers: Flagellates.

Data showed that concentrations of 10 and 50 ppb Cu added to phytoplankton communities in experimental enclosures caused a rapid decrease in the phytoplankton concentration. After 2-3 weeks, the phytoplankton biomass was comparable to that in control enclosures but the species composition was radically altered from a predominately diatom drop (Chaetoceros sp.) to one of microflagellates ranging in size from 1 to 10 micron in diameter. Such alterations in the phytoplankton crop can be expected to have important consequences in regard to other trophic levels. It has been noted that there is a large increase in bacterial numbers concomitant with the loss of the Chaetoceros sp. shortly after the addition of Cu. The change in species composition from diatoms to small flagellated cells may also have significant effects on the zooplankton populations. (See also W76-08935) (Chilton-ORNL)
W76-08947

THE REPLICATION OF BIOLOGICAL EVENTS IN ENCLOSED WATER COLUMNS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. Takahashi, W. H. Thomas, D. L. R. Seibert, J. R. Beers, and P. Koeller.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 593-623, 10 fig, 27 ref, 2 tab.

Descriptors: *Ecology, *Marine biology, Aquatic life, Water, Sea water, Water pollution effects.

The purpose of the experiments was to study the life history of large columns (70 tons) of water when they are separated from the normal forces of advection and turbulence. Data showed that the four containers behaved biologically in a very similar manner and that their ecology was essentially the same as that found in the outside environment. These experiments suggest that such containers can be used by marine ecologists concerned with the total interaction of organisms in their natural state or under the influence of perturbations such as may be caused by pollutants. (See also W76-08935) (Chilton-ORNL)
W76-08948

MICROPLANKTON OF THE NORTH PACIFIC CENTRAL GYRE. I. POPULATION STRUCTURE AND ABUNDANCE, JUNE 1973,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
J. R. Beers, F. M. H. Reid, and G. L. Stewart.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 625-694, 9 fig, 3 tab, 72 ref.

Descriptors: *Populations, Census, Aquatic life, Biomass, Phytoplankton, Pacific Ocean.

A quantitative description was made of the populations of living organisms in the approximate size range of 2-200 micrometers from the upper 200 m of the water column at six sites on a 20 mi by 20 mi grid. Total abundance of the organisms averaged over the six locations decreased from 450000 to 480000 individuals per liter in the upper and middle levels of the euphotic zone to 68000 individuals/l at 180-200 m. Organisms in the net plankton size range were less than 1% of the total numbers at all depths but they accounted for fractions of the biomass carbon increasing from approximately 1/6 in the upper waters to 1/3 in the lower depths examined. The dominant taxa in terms of both numbers and biomass were small monads and flagellates and non-thecate dinoflagellates. (See also W76-08935) (Chilton-ORNL)
W76-08949

NUTRIENT REGENERATION BY OCEANIC ZOOPLANKTON: A COMPARISON OF METHODS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. M. Mullin, M. J. Perry, E. H. Renger, and P. M. Evans.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202, p 695-709, 2 fig, 1 tab, 13 ref.

Descriptors: *Nutrients, *Energy balance, Nitrogen, Phosphates, Sea water, *Zooplankton, Aquatic animals, Methodology, Cycling nutrients.
Identifiers: *Nutrient regeneration.

In stratified surface waters with no upwelling, excretion by zooplankton is the most important means of regenerating nutrient elements, notably nitrogen and phosphorus. The rate of regeneration of phosphate and ammonium by zooplankton in the mixed layer was estimated directly from the release of these nutrients by unsorted catches, and indirectly from the rates of release by selected animals ranging widely in size. Direct estimates from unsorted catches resulted in a higher estimate of regeneration than did the indirect estimates from selected animals. This difference may have been due to release of nutrients by injured or killed animals in the unsorted catches. (See also W76-08935) (Chilton-ORNL)
W76-08950

DISTRIBUTION, MORPHOMETRY, AND SEASONAL BIOLOGY OF THE PLANKTONIC COPEPODS, NEOCALANUS ROBUSTIOR AND N. GRACILIS, IN THE PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
M. M. Mullin, and P. M. Evans.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202. p 711-738, 5 fig, 2 tab, 26 ref.

Descriptors: *Ecology, Aquatic animals, *Copepods, *Distribution patterns, Biology, *Seasonal, Size, *Pacific Ocean.

The study concerns a pair of sibling species differing mainly in size. Both species are reported from the Pacific, Atlantic, and Indian Oceans. They are among the 20 numerically most important species of large copepods in the central gyre of the North Pacific. Neocalanus gracilis has a wider geographical range to the north and south. Both species are most abundant in the upper 200 m. The center of distribution of N. gracilis is generally deeper than that of N. robustior during the day. The copepodite stages of the two species are distinguishable by bodily size. Both species probably breed throughout the year in the eastern Central North Pacific and there was no evidence that the seasonal patterns of abundance of the two species differed. (See also W76-08935) (Chilton-ORNL)
W76-08951

VITAMINS IN THE SOUTH POLAR SEAS, I. DISTRIBUTION AND SIGNIFICANCE OF DISSOLVED AND PARTICULATE VITAMIN B 12, THIAMINE, AND BIOTIN IN THE SOUTHERN INDIAN OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
A. F. Carlucci, and R. L. Cuhel.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202. p 741-765, 5 fig, 2 tab, 16 ref.

Descriptors: *Biochemistry, *Vitamins, Vitamin B, Distribution, Sea water, Pacific Ocean, *Indian Ocean.

Concentration of dissolved B12 in the upper 75 m waters averaged 0.2 ng B12/l; most samples containing considerable amounts of B12 were from the more southerly stations. Particulate B12 ranged from 0.003 to 0.26 ng/l with the higher concentrations being found in the upper 75 m waters. Dissolved thiamine concentrations ranged from undetectable amounts to 7 ng/l, but only 7% of the samples contained detectable thiamine. Particulate thiamine concentrations varied from undetectable to 10.50 ng/l with most of the thiamine being found in the upper 75 m waters. Dissolved biotin was present in 64% of the samples and ranged from undetectable to 4.3 ng/l. Particulate biotin was present in all samples and ranged from 0.01 to 1.44 ng/l. Comparison of B12 with ATP, particulate organic carbon, and inorganic nutrient data indicated that biological uptake was responsible for the low amounts of B12 for at least 13 of the 16 stations studied. (See also W76-08935) (Chilton-ORNL)
W76-08952

LEUCOTHRIX: ABSENCE OF DEMONSTRABLE FIXATION OF N2,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
T. H. Mague, and R. A. Lewin.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975. UCSD 10P20-202. p 767-773, 8 ref.

Descriptors: *Biochemistry, *Nitrogen fixation, Aquatic algae, Analytical techniques, *Bioassay, Analytical techniques, Pollutant identification.
Identifiers: *Leucothrix mucor.

A possible affinity with blue-green algae suggested that Leucothrix might be able to fix N2. This was tested by the acetylene reduction assay for nitrogenase activity. Acetylene reduction was not detected under aerobic, microaerophilic, or anaerobic conditions in any of the samples tested. This lack of demonstrable nitrogenase activity, corroborating the severely limited growth of filaments in nitrogen-free medium, provides strong evidence that this organism is unable to fix N2. (See also W76-08935) (Chilton-ORNL)
W76-08953

COCCOLITH SEDIMENTATION BY FECAL PELLETS: LABORATORY EXPERIMENTS AND FIELD OBSERVATIONS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
P. H. Roth, W. H. Berger, and M. M. Mullin.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202. p 775-793, 3 fig, 28 ref.

Descriptors: *Sedimentation, Geochemistry, Laboratory tests, On-site investigations, Copepods.
Identifiers: *Coccoliths, *Fecal pellets.

Experiments showed that cocclithophorids are readily ingested by at least some copepods, pass their guts relatively unharmed, and occur in large numbers in fecal pellets. Some mechanical breakage occurs, especially among delicate forms. There are indications that etching is unimportant as compared to breakage during passage through the copepod guts. Fecal pellet transport of coccoliths is a feasible mechanism of sedimentation. The paleontological, sedimentological, and geochemical implications of such transfer could be of great importance. (See also W76-08935) (Chilton-ORNL)
W76-08954

AMINO ACID UPTAKE AND RESPIRATION BY MARINE HETEROTROPHS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
P. J. leB. Williams, T. Berman, and O. Holm-Hansen.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 795-813, 1 fig, 3 tab, 15 ref.

Descriptors: *Photosynthesis, Aquatic animals, Respiration, *Amino acids, Turnovers, Marine animals.
Identifiers: *Marine heterotrophs.

The concentration and turnover of dissolved free amino acids was measured at a station six miles off the California coast from depths of 25 and 100 m on three occasions. The ambient concentration of individual amino acids in the water varied from undetectable to 3 micrograms/l, with the total amino acid concentration ranging from 1.8 to 8.5 micrograms/l. The predominant amino acids were serine, lysine, aspartate, glutamate, and alanine. The rate of heterotrophic turnover of the ten individual amino acids studied ranged from undetectable to 1.2 micrograms/l. day. Total calculated amino acid turnover varied from 0.015 to 3.16 micrograms/l. day. The rates were 15-50 times higher in samples taken from 25 meters than those from 100 meters. The amino acid flux amounted to 1-10% of photosynthetic carbon dioxide fixation and was in some cases comparable to the total rate of release of soluble photosynthetic products. (See also W76-08935) (Chilton-ORNL)
W76-08955

CYCLING OF ORGANIC CARBON IN THE OCEAN: USE OF NATURALLY-OCCURRING RADIOCARBON AS A LONG AND SHORT TERM TRACER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
P. M. Williams, and T. W. Linick.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 815-837, 5 tab, 36 ref.

Descriptors: *Water pollution, Organic matter, Carbon, *Carbon cycle, Aquatic animals, *Path of pollutants, Cycles, Carbon radioisotopes, *Cycling nutrients.

The paper presents data on the natural radiocarbon activity of surface, bathypelagic and benthic marine organisms, and for the C14 activity of the dissolved inorganic carbon in surface waters. The results are interpreted with respect to the overall mechanisms operating in the oceans in the cycling and removal of organic matter over short and long time periods (months to decades). It was concluded that organic pollutants such as halogenated hydrocarbons and biphenyls, crude oil residues, toxic organometallic compounds, and as yet undefined anthropogenic organic material which enters the marine food chains by various mechanisms may persist in the deep sea for long periods or be removed from the oceans in a relatively short time depending on the specific pathway it follows. (See also W76-08935) (Chilton-ORNL)
W76-08956

NUTRIENT CYCLING BETWEEN THE WATER COLUMN AND A MARINE SEDIMENT. I. ORGANIC CARBON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
E. O. Hartwig.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 839-870, 8 fig, 35 ref.

Descriptors: *Photosynthesis, Nutrients, Organic matter, Carbon, Cycling, Sediments, Aquatic life, Benthos, Sea water, *Cycling nutrients.

The carbon flow was determined through sediments at a station in 18.3 m of water off the San Diego County coast. The parameters investigated and their mean rates of input or output to the benthos were macro-detritus, fallout of particulate matter, benthic net photosynthesis during daylight hours, burial, benthic night time respiration, and resuspension. Resuspension of sediment appears to have a controlling effect on the sediment organic carbon content. Benthic photosynthesis was found to provide 79% of the organic carbon required by the benthos for respiration during the daylight hours. (See also W76-08935) (Chilton-ORNL)
W76-08957

IMPROVED METHODOLOGY FOR ATP DETERMINATION IN MARINE ENVIRONMENTS,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. E. Hodson, O. Holm-Hansen, and F. Azam.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 871-888, 3 fig, 1 tab, 20 ref.

Descriptors: *Analytical techniques, Separation techniques, Sea water, Aquatic environment, Methodology, *Pollutant identification.
Identifiers: *Adenosine triphosphate.

Three procedures; Tris extraction, conventional acid extraction, and charcoal adsorption method, for extraction of ATP from marine sediments were evaluated. It was found that the charcoal column procedure was suitable since it extracts with high efficiency, removes inhibitory substances, and permits ATP to be concentrated many fold from large volumes of dilute extract. (See also W76-08935) (Chilton-ORNL)
W76-08958

COPEPOD SLICK IN THE NORTHWEST PACIFIC OCEAN,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
R. F. Lee, and P. M. Williams.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 889-896, 1 tab, 17 ref.

Descriptors: *Water pollution, Mortality, *Copepods, *Pacific Ocean, Pollutant identification.
Identifiers: Calanus sp.

Crewmen aboard the U.S. Coast Guard Cutter Minnetonka observed an extensive red slick located between Honolulu and Japan on April 7, 1971. The slick extended in all directions and was observed during a 2 week period along a 10-60 mile grid. Sampling showed that the organisms making up the slick were copepod remnants identified as a species of Calanus. Analysis of the sample showed 55% lipid with the remainder protein and chitin. A high mercury content was also found in the samples. It was hypothesized that the kill may have occurred as a result of pollution of terrestrial origin. (See also W76-08935) (Chilton-ORNL)
W76-08959

CRUISE SUMMARY, A. SOUTHERN CALIFORNIA BIGHT STUDIES (SCBS).
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 899-902.

Descriptors: *Cruises, *On-site investigations, Populations, Plankton, Chemistry, Primary production, Sea water, California, Coasts.
Identifiers: *South California Bight.

A series of quarterly cruises was initiated in September of 1974 in the Southern California Bight. The program has three goals: (1) to investigate local effects of the San Onofre generating station operations on plankton population dynamics and sea water chemistry, (2) to measure standing stocks and production of plankton by season with respect to water circulation and nutrient chemistry, and (3) to provide opportunities for personnel to carry out studies of ecologically significant problems. (See also W76-08935) (Chilton-ORNL)
W76-08960

CRUISE SUMMARY, B. GULF OF CALIFORNIA PHOTOBIOLOGY CRUISE,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
In: Research on the Marine Food Chain, Progress Report for the period July 1974-June 1975, UCSD 10P20-202, p 903-912.

Descriptors: *Cruises, Physiological ecology, Biology, Light, Phytoplankton, Photosynthesis, Respiration, Inhibition, Nutrients, Gulf, Mexico.
Identifiers: *Gulf of California.

The primary purpose of the expedition was to investigate the effects of light duration and intensity on phytoplankton photosynthesis, photorespiration, photoinhibition, chlorophyll flourescence, and on inorganic nutrient uptake. 18 cruise report titles are given. The sampling program included the entire euphotic zone but particular attention was given to surface water where light intensity was highest and to the lower portions of the euphotic zone where the light intensity was 0.1 to 1.0% of surface light intensity. Many of the physiological reactions being studied were dependent on the species composition of the phytoplankton crop, water temperature, and nutrient concentrations. (See also W76-08935) (Chilton-ORNL)
W76-08961

BEHAVIORAL IMPAIRMENT PRODUCED BY EXPOSURE TO SUBCLINICAL AMOUNTS OF METHYLMERCURY CHLORIDE,
Virginia Polytechnic Inst. and State Univ. Blacksburg.
R. Hughes, R. Belser, and C. W. Brett.
Environmental Research, Vol. 10, p. 54-58, 1975 1 tab, 11 ref.

Descriptors: *Animal physiology, *Animal behavior, *Mercury, *Toxicity.
Identifiers: *Methlmercury chloride, *Behavior impairment.

Rats exposed to small amounts of methylmercury at age 28, 35, and 42 days were impaired in their ability to learn an active avoidance response on tests conducted when they reached adulthood. The amount of methylmercury to which the animals were exposed did not affect food or water intake, body weight, brain weight, or adrenal weight. While adult rats did not exhibit behavior impairment when exposed to an equivalent amount of methylmercury, data shown that postnatal exposure as well as in utero exposure leads to behavior defects. The possibility of an inverse relationship between behavior impairment produced by exposure to methylmercury and the age at which exposure occurs is indicated. Therefore, behavioral indices provide a more sensitive index of the toxic effects of methylmercury than clinical indices. (Hoyle-Vanderbilt)
W76-09037

THE EFFECT OF LEAD ON MOUSE BRAIN DEVELOPMENT,
Mount Sinai School of Medicine, New York.
H. S. Maker, G. M. Lehrer, and D. J. Silides.
Environmental Research Vol. 10, p. 76-91, 1975, 6 fig., 4 tab, 18 ref.

Descriptors: *Heavy metals, *Lead, *Toxicity, Pathology, Biology, *Animal physiology, Animal behavior, Growth stages, Reproduction, Laboratory animals, Rodents, Water pollution effects, Pollutant identification.
Identifiers: Mouse brain development, *Neurological retardation, Swiss-Webster albino mice.

Nursing C57 black or Swiss-Webster albino mother mice were given lead carbonate in food pellets or lead acetate in drinking water in doses ranging from 0.08 to 2.0% lead, and the pups were maintained on the lead diet through 60 days. The highly inbred C57 mice only rarely raised their litter if given 0.8% lead but the less inbred albino mice accepted up to 2% lead. A dose-related retardation as high as 50% of controls in body growth, brain development, and sexual and behavioral maturation was found. Retardation at the various lead doses was better correlated with lead concentration in the diet than with food consumption, therefore, undernutrition is apparently not the major cause of the retardation. (Hoyle-Vanderbilt)
W76-09038

SEDIMENT LOADING, ITS EFFECT ON A SOUTHERN ARIZONA LAKE AND THE EMERGING SPRING ZOOPLANKTON COMMUNITY,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2J.
W76-09073

EXPERIMENTAL STUDY OF THE EFFECT OF TEMPERATURE AND DEGREE OF OXYGEN SATURATION ON THE DESTRUCTION RATE OF SOLUBLE PROTEINS IN NATURAL WATERS, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. K. Ryabov, B. I. Nabivanets, G. N. Oleinik, T. Y. Smikun, and L. V. Podgaevskaya.
Gidrobiol Zh. 10(5); p 15-25, 1974.

Descriptors: Proteins, Microorganisms, *Oxygen, *Temperature, Solubility, Natural waters, Water quality.
Identifiers: Destruction rate, Oxygen saturation.

Elevation of temperature and a rise in O2 content result in an increase in the destruction rate, which is connected chiefly with intensification of microorganism activity. The rate constants and activation energy values of the destruction process vary within 0.002-0.38 day-1 and 7-15 kcal/mol degree. When water is saturated with G2 up to 50%, the number of microorganisms sharply increases, which results in a deterioration of the water sanitary state. Rate constants and the activation energy of protein destruction under different conditions are determined.–Copyright 1976, Biological Abstracts, Inc.
W76-09078

INVESTIGATIONS ON THE PHYTOPLANKTON AND SOME ENVIRONMENTAL PARAMETERS OF THE SHATTAL-ARAB (IRAQ), (IN GERMAN)
Rostock Univ. (East Germany). Dept. of Biology.
For primary bibliographic entry see Field 2L.
W76-09084

STUDY OF ALGOFLORA OF CONTAMINATED WATER BODIES, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Botaniki.
N. S. Vodop'yan.
Ukr Bot Zh. 31(2), p 179-184, 1974.

Descriptors: *Algae, Water pollution effects, Canals, *Chlorophyta, Chrysophyta, *Cyanophyta, *Industrial wastes, Pyrrophyta, Toxicity, Englenophyta, Seasonal.
Identifiers: *Bacillariophyta.

The algoflora was studied in a canal into which industrial wastes flow. During the 1971 vegetation period 143 taxons (Chrysophyta, 2 spp., Pyrrophyta, 1 sp.; Euglenophyta, 3 spp.; Chlorophyta, 63 spp., 7 varieties, 2 forms; Bacillariophyta, 39 spp., 3 varieties; Cyanophyta, 22 spp.) were found. Algal development underwent seasonal changes and showed a dependence on main hydrochemical indices of the wastewater. Water quality should be determined mainly by toxic contamination.--Copyright 1976, Biological Abstracts, Inc.
W76-09093

DIGESTIVE ACTIVITIES OF CARP AS A MAJOR CONTRIBUTOR TO THE NUTRIENT LOADING OF LAKES,
V. A. Lamarra, Jr.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2461-2468, 1975. 5 fig., 5 tab., 11 ref.

Descriptors: *Benthos, *Carp, Freshwater fish, *Bottom fish, Aquatic productivity, Surface waters, Ponds, *Phosphorous compound, *Cycling nutrients, Minnesota, Lakes.
Identifiers: *Orthophosphates, *Nutrient loading, Fish feeding.

Studies in a series of Minnesota ponds indicate the fish species, carp, that are bottom feeders, can circulate phosphorous from the bottom organisms into the pond waters. Discrepancies between nutrient loading and lake conditions, especially observed in shallow lakes with high productivity, may be due to bottom feeding fish. (Katz)
W76-09103

PHOSPHOROUS FLUX THROUGH FISHES,
J. F. Kitchell, J. F. Koonce, and P. S. Tennis.
Verhandlungen Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2478-2484, 1975. 4 fig., 3 tab., 25 ref.

Descriptors: *Phosphorous, Freshwater fishes, Fish physiology, *Eutrophication, Lakes, *Sunfishes, Biology, Number fish per acre, Fish populations, *Mortality, Aquatic productivity, *Nutrient, *Lake sediments, Fish reproduction, Fish kill, Lake fishery, *Wisconsin.
Identifiers: *Lake Wingra(Wis), Bluegill sunfish, Lepomis macrochirus, Phosphorous budgets.

In Lake Wingra, fish biomas represents 870 kg of phosphorous to the lake. Fish production processes 60-70% of the annual phosphorous input; 30-35% of the input is lost to sediment as fish bones and scales. Remineralization of dead post-spawning fish amounts to 150 kg of phosphorous during the late spring and early summer, thus affording a continuing source to planktonic production. Excretory release phosphorous by fishes seems quantitatively less important but may help stabilize planktonic cycles. (Katz)
W76-09104

CHANGES IN THE COMPOSITION OF THE PLANKTON OF THE RIVERS RHINE AND MEUSE IN THE NETHERLANDS DURING THE LAST FIFTY FIVE YEARS,
R. Peelen.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1997-2009, 1975. 5 fig., 5 tab., 3 ref.

Descriptors: *Phytoplankton, *Water quality, *Bioindicators, *Plankton, Aquatic algae, *Eutrophication, Monitoring, *Phosphorous, *Dissolved oxygen, Biological communities, Rivers, Europe, Water pollution effects.
Identifiers: *Rhine River, *Meuse River, Saprobic index, Microcystis, Oscillatoria, Aphanizomenon, *Netherlands.

Substantial changes took place in the physical-chemical environment of the Rivers Rhine and Meuse in the past fifty-five years. Increased eutrophication of the Rhine backwaters brought beta-mesosaprobic organisms as far downstream as the Dutch frontier. No change in the saprobic grade of plankton of the Dutch part of both rivers took part in the last 55 years. Compared to 1916 an increase in total numbers took place. (Katz)
W76-09105

ALGAL COMMUNITIES IN POLLUTED RIVERS OF SOUTH WALES,
K. Benson-Evans, P. F. Williams, R. O. McLean, and N. Prance.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2010-2019, 1975 3 fig., 4 tab., 11 ref.

Descriptors: *Bioindicators, *Sessile algae, *Diatoms, Sewage, Industrial wastes, Water pollution sources, Water quality, Biological communities, Environmental gradient, *Ecological distribution, Methodology, *Statistical methods, Rivers.
Identifiers: *Biotic indices, Factor analysis, Tolerant organisms, Non-tolerant organisms, *South Wales, Biological analyses.

Studies on the rivers of South Wales indicate that numerical biotic indices are a satisfactory method of biological appraisal, particularly when applied to individual river systems. The weakness of such indices is their lack of species or genera identity. Autoecological studies have indicated the complexity of factors affecting even single species. Biotic indices involving species are more effective when devised for a particular type of river or even for specific types of pollution. Two such indices applied to rivers of the South Wales region appeared to have reflected water quality successfully, whereas indices or schemes devised for other areas have not proved so successful. (Katz)
W76-09107

THE CRUSTACEAN PLANKTON OF AN ACID RESERVOIR,
J. DeCosta.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1805-1813, 1975. 10 fig., 4 tab., 15 ref.

Descriptors: *Zooplankton, Crustaceans, *Copepods, *Daphnia, *Mine drainage, Acid mine water, Water quality, Surface waters, Hydrogen ion concentration, Biological communities, *Dominant organisms, Oligotrophy, West Virginia, Reservoirs, Pennsylvania.
Identifiers: *Cheat Lake(WVa-Penn), *Bosmina, *Cyclops, *Mesocyclops, Diaphanosoma.

The Cheat Lake crustacean zooplankton assemblage is a very simple community characterized by extreme dominance and extreme oligotrophy. There is no significant effect at the more acid lake stations on the quantity of zooplankton. There are significant qualitative differences between the more acid lake stations and the more neutral backwater stations. (Katz)
W76-09109

LABORATORY EXPERIMENTS TO DETERMINE THE LIMITS OF TOLERANCE OF FLAGELLATES TO SOME ABIOTIC FACTORS,
R. Bretthauer.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2043-2050, 1975. 3 fig., 2 tab., 18 ref.

Descriptors: Methodology, *Heat resistance, *Acidic water, *Hydrogen ion concentration, *Phytoplankton, *Ochromonas, Plant populations, Growth rate, Growth chamber, Laboratory tests, Thermal pollution, Water pollution effects.
Identifiers: *Ochromonas sociabilis, *Flagellates.

The ecological limits of tolerance of Ochromonas sociabilis to various pH values and temperatures were investigated in culture experiments. This species prefers acidic media and could be cultured for more than two weeks at pH 4 to 8. Maximal growth was at pH 6. The lower limit of temperature tolerance is the freezing point of the growth medium; the upper limit is 35C, while the highest population density was observed at 30C. These findings were confirmed by experiments in which various pH-temperature combinations were investigated. (Katz)
W76-09110

MERCURY UPTAKE IN ROOTED HIGHER AQUATIC PLANTS; LABORATORY STUDIES,
C. Eriksson, and D. C. Mortimer.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2087-2093, 1975. 4 fig., 3 tab., 7 ref.

Descriptors: *Mercury, Methodology, *Plant growth, Aquatic plants, Marsh plants, *Rooted aquatic plants, Plant physiology, Submerged plants, Soil-water-plant relationships, Cultures, Water pollution effects, Laboratory tests, *Canada, *Absorption, Rivers.
Identifiers: Ottawa River, *Sagittaria latifolia, *Scirpus cyperinus.

In an experiment it was shown that mercury did not seem to affect the growth of Sagittaria or Scirpus. Plants were active in the uptake of mercury. The higher the concentration in the water, the more is accumulated in the shoot and this is independent of the concentration level in the soil. Submersed parts retained more mercury than emersed parts. Roots were able to take up mercury where such is present in the surrounding medium. In Scirpus, mercury was found at a higher level than in Sagittaria. (Katz)
W76-09111

FISHES IN OXYGEN-MINIMUM ZONES: BLOOD OXYGENATION CHARACTERISTICS,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Biology.
E. L. Douglas, W. A. Friedl, and G. V. Pickwell.
Science, Vol. 1191 No 4230, p 957-959, 1976 1 tab., 23 ref.

Descriptors: *Fish physiology, *Marine fish, *Analytical techniques, *Oxygen requirements, *Anaerobic conditions, Dissolved oxygen, *Respiration, Marine biology, Oceans, Adaptation, *Oxygenation.
Identifiers: Mid-water Pelagic fish, *Blood oxygen capacity, Oxygen dissociation curves, Swim bladder oxygen, Myctophidae, Melaphaide, Gonostomatidae.

Teleosts living in some mid-water pelagic regions of the Pacific are hypoxic or anaerobic during most of the day and become aerobic only during their diurnal migrations to and from the sea surface. The blood oxygen capacities of these fishes are among the lowest ever reported, and the oxygen dissociation curves show a very low affinity for oxygen. (Katz)
W76-09112

EFFECTS OF COPPER ON THE CORAL REEF ECHINOID ECHINOMETRA MATHAEI,
Guam Univ., Agana. Marine Lab.
G. A. Heslinga.

Marine Biology, Vol. 35, p 155-160, 1976. 6 fig, 11 ref.

Descriptors: *Copper, Sea water, Marine animals, Reefs, Coral, *Reproduction, *Metals, *Embryonic growth stage, Aquatic life, Toxicity, Bioassay, Fertilization, Pollutant identification.
Identifiers: *Coral-reef Echinoid, Fertilization success, Echinometra mathaei, Early cleavage, Larval skeletal development, 96-h TL50.

The effects of copper-enriched seawater on fertilization success, early cleavage, larval skeletal development, and survivorship of adults of the coral-reef echinoid Echinometra mathaei (de Blainville) were tested. Fifty percent reduction of fertilization success and cleavage success to the 8-cell stage occurred in 0.18 and 0.42 mg added Cu++/l, respectively. Adults had respective 48- and 96-h TL50 values of 0.54 and 0.30 mg/l. Larval skeletal development was suppressed in 0.02 mg/l. The latter process appears to be very sensitive and may be the most suitable for assessing effects of stress on this species. (Katz)
W76-09113

INTERACTIVE EFFECTS OF PREDATION PRESSURE AND INSECTICIDE (TEMEFOS) TOXICITY ON POPULATIONS OF THE MARSH FIDDLER CRAB UCA PUGNAX,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Entomology and Economic Zoology.
D. V. Ward, B. L. Howes, and D. F. Ludwig.
Marine Biology, Vol. 35, p 119-126, 1976 3 fig., 17 ref.

Descriptors: Crustaceans, *Pesticides, *Crabs, Aquatic animals, *Toxicity, *Mortality, *Organophosphorous pesticides, Animal populations, On-the site studies, Shore birds, *Predation, Water pollution effects.
Identifiers: *Marsh birds, Predation, *Temefos, Temefos population density, Marsh fiddler crab, Uca pugnax, Arian predation.

The interactions of predation pressure with lethal and sublethal effects of temefos (Abate), an organophosphorous insecticide, were studied in field populations of Uca pugnax. Changes in fiddler crab population densities were followed in open-marsh temefos-treated and untreated test plots and in treated and untreated plots which were caged over to reduce predation by marsh birds. Temefos significantly reduced the population density of U. pugnax in the open test plots but not in the caged plots. These results indicate that temefos has a primarily sublethal effect on the crabs, the effect becoming lethal only after interaction with avian predation. Evidence from the presence of a time-lag effect in the population decrease, from a calculated predation index, and from laboratory studies reported elsewhere of behavioral alteration by temefos also supports the conclusion that temefos primarily impairs the escape response of U. pugnax: this leads to increased predation and subsequently to a decreased fiddler crab population. (Katz)
W76-09114

TOXICITY OF MINE DRAINAGE TO EMBRYONIC AND LARVAL BOREAL TOADS (BUFONIDAE: BUFO BOREAS),
Denver Univ., Colo. Dept. of Biological Sciences.
K. R. Porter, and D. E. Hakanson.
Copeia, Vol. 2, p. 327-331, 1976. 1 tab., 24 ref.

Descriptors: Iron, Copper, Zinc, Hydrogen ion concentration, *Toxicity, *Bioassay, *Mine wastes, Mine water, Water pollution effects, Chemical analysis, *Toads, Colorado, Pollutant identification, *Mine drainage.
Identifiers: *Boreal toads, Bufo boreas, Clear Creek County(Colo), Toad larvae.

Chemical analyses and bioassays of mine drainage were made to determine if it could be a factor accounting for the absence of amphibians from Clear Creek County, Colorado. The concentrations of hydrogen ion, iron, copper and zinc in the drainage were all individually much greater than the tolerance levels of premetamorphic toads. The lethality of the drainage was of such a magnitude that it required diluting approximately one thousand times before larvae could survive in it. Boreal toad (Bufo boreas) larvae are more resistant to acidity than most fish but are very similar to other anuran larvae and salmonids in their sensitivity to copper and zinc. (Katz)
W76-09115

PRE-IMPOUNDMENT SITE PREPARATION: A STUDY OF THE EFFECTS OF TOPSOIL STRIPPING ON RESERVOIR WATER QUALITY,
For primary bibliographic entry see Field 4C.
W76-09117

THE AVAILABILITY OF 137-CS TO FISHES FROM INGESTED CLAYS,
L. D. Eyman, and J. T. Kitchings.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2504-2509, 1975. 1 fig., 2 tab., 11 ref.

Descriptors: Freshwater fish, *Sediments, *Radioactive wastes, Environmental effects, *Cesium, *Channel catfish, *Sunfishes, Radioactivity, Aquatic life, Fish management, Kaolinite, Illite, Montmorillonite, *Clays, Water pollution effects, *Absorption.
Identifiers: Fish feeding.

Studies suggest that under certain conditions 137-Cs accumulations in fish can be greatly influenced by (1) the passive ingestion of sediment clays containing radioactive cesium and (2) the availability of the nuclides for assimilation as determined by the binding capabilities of the clay fraction. (Katz)
W76-09118

ENVIRONMENTAL CHANGES IN A PORTION OF LAKE ONTARIO FOLLOWING POLLUTION ABATEMENT,
J. H. Judd, and J. G. Bocsor.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1984-1989, 1975. 1 fig., 2 tab., 28 ref.

Descriptors: Biological communities, Industrial wastes, Pulp and paper industry, *Lake Ontario, Lake shores, *Succession, *Benthos, *Pulp wastes, Amphipoda, Diptera, Oligochaetes, Gastropoda, *Benthic fauna, *Environmental effects, Water pollution effects, *Pollution abatement, New York.
Identifiers: *Gammarus, Cricotopus, Diversity values, Taxonomic listings, Oswego(NY).

Following abatement of effluent discharge of a paper mill into Lake Ontario, the affected littoral zone returned rapidly to conditions normally found along that region of the lake. Biological diversity values at station 1 were similar to that at station 3 (control). New species present were indicative of clean water. (Katz)
W76-09119

EFFECT OF CONSTANT AND VARYING TEMPERATURE ON EGG PRODUCTION OF LYMNAEA OBRUSSA SAY (MOLLUSCA: GASTROPODA),
J. S. Mattice.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 3174-3178, 1975. 3 fig., 10 ref.

Descriptors: *Gastropods, *Snails, *Reproduction, *Fecundity, Methodology, *Water temperature, *Thermoperiodism, Mollusks, Seasonal.
Identifiers: *Lymnaea obrussa, Constant temperature, Seasonal temperature variation, Diurnal temperature variation, *Snail egg production.

Laboratory and concurrent field observations indicate an inaccuracy in extrapolating data on egg production in the laboratory at constant temperatures, to field conditions with seasonal or diurnal fluctuations. As compared to egg production rates at constant temperature, seasonal temperature variation caused a decrease while seasonal plus diurnal temperature variation caused increase in egg production. (Katz)
W76-09120

AXENIC CULTURES OF TETRAHYMENA PYRIFORMIS AS TOXICOLOGICAL TOOLS,
For primary bibliographic entry see Field 5A.
W76-09121

ENDRIN TOXICITY AND DISTRIBUTION IN FRESHWATER: A REVIEW,
Bureau of Sport Fisheries and Wildlife, Marion, Ala. Southeastern Fish Cultural Lab.
B. F. Grant.
Bulletin of Environmental Contamination and Toxicology, Vol. 15, No. 3 p. 283-292, 1976. 40 ref.

Descriptors: *Reviews, *Bibliographies, Data collections, *Endrin, Water quality control, *Toxicity, *Absorption, Environmental effects, Chlorinated hydrocarbon pesticides, Pesticides, Insecticides, Lethal limit, Crustacea, Fish, Invertebrates, *Path of pollutants, Public health, Water pollution effects, Distribution.
Identifiers: Bioaccumulation.

Forty-nine reports containing information about endrin are summarized. This review should assist in evaluating potential consequences of continued endrin use and its impact as an aquatic pollutant. These and other investigations are the basis for recommended maximal amounts of 2 pptr endrin in water for the protection of aquatic organisms. (Katz)
W76-09122

RESPONSES OF ARCTIC MARINE CRUSTACEANS TO CRUDE OIL AND OIL-TAINTED FOOD,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Arctic Biological Station.
J. A. Percy.
Environmental Pollution, Vol. 10, p 155-162, 1976. 3 tab, 13 ref.

Descriptors: *Crustaceans, *Oil wastes, Water pollution effects, Arctic, Foods, *Animal behavior, *Amphipoda, *Isopods, Environmental effects, Laboratory tests, Behavior, Oil pollution, *Oil spills, Oily water, Invertebrates, Mortality, Water pollution effects.
Identifiers: *Crude oil, *Arctic marine crustaceans, Avoidance.

The responses of several arctic marine crustaceans to oil masses and oil-tainted food have been investigated. None of the species was attracted to crude oil. Amphipods tended to avoid oil masses; however, the response was significantly diminished if the oil was weathered or if the animals were pre-exposed to light crude oil emulsions. Untainted food was preferentially selected over oil-tainted food. In contrast, an isopod was generally neutral to the presence of oil masses and consumed oil-tainted food as readily as untainted material. (Katz)
W76-09123

AN INVESTIGATION OF ANTIBIOTIC AND DRUG RESIDUES IN FISH,
Veterinary Research Labs., Belfast (Northern Ireland).
A. McCracken, S. Fidgeon, J. J. O'Brien, and D. Anderson.

The Journal of Applied Bacteriology, Vol. 40, No. 1, 2 fig., 3 tab., 7 ref.p. 61-66, 1976.

Descriptors: Pest control, *Rainbow trout, *Biocontrol, *Antibiotics(Pesticides), *Bactericides, *Bioassay, Public health, Fish farming, Aquaculture, *Pesticide residues, Fish management, Temperature, Methodology, Water pollution effects.
Identifiers: *Drug residues, Tissue analysis, Chloramphenicol, Oxytetracycline, Framycetin, Sulphadiazine.

Young rainbow trout were given intraperitoneal injections of either chloramphenicol, framycetin, oxytetracycline or sulphadiazine/trimethoprin and muscle tissue was examined by microbiological assay over a period of weeks for the presence of active residues. Chloramphenicol and framycetin could not be detected in fish muscle 7 days after intraperitoneal injection. Oxytetracycline residues could not be detected after 28 days but trimethoprim residues were present in muscle 77 days after injection. Test results show a rapid build-up of antibiotics in fish muscle after oral dosage and indicate that the administration period of 10 or 14 days is unnecessary and that increased levels of either oxytetracycline or trimethoprim for 3 or 4 days may be a more satisfactory method of combating disease outbreaks. (Katz)
W76-09124

RESILIENCE OF A ROCKY INTERTIDAL FISH COMMUNITY IN A PHYSICALLY UNSTABLE ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Ecology and Evolutionary Biology.
D. A. Thomson, and C. E. Lehner.
Journal of Experimental Marine Biology and Ecology, Vol. 22, p. 1-29, 1976. 7 fig., 8 tab., 45 ref.

Descriptors: Marine fish, *Intertidal areas, *Water level fluctuations, *Tides, Shallow water, High water mark, Low water mark, Biological communities, *Bottom fish, *Water temperature, Succession, Water pollution effects.
Identifiers: *Tide pools, Fish communities, Tropical fish, Temperate fish, Low water temperature, *Gulf of California, Fish census, Species diversity.

A 7-year census of intertidal fishes has been made by repeated defaunation of tide pools in the northern Gulf of California. The intertidal fish community showed long-term resilience, and hence stability, under a rigorous, unstable physical environment. Although the majority of fishes have tropical affinities (76%), warm temperate species (24%) constitute 33% of total numbers and 69% of total biomass of the entire intertidal fish community. Short-term seasonal fluctuations in species diversity and population numbers of temperate fishes were in better synchrony with the annual light regime and sea temperature cycles than those of tropical species. A winterkill due to abnormally low sea temperatures in January, 1971, exerted faunal selection by killing several tropical fishes. Warm temperate species tolerated these low temperatures both experimentally and during the 1971 winterkill. Low sea temperatures were judged to be more limiting to diversity than high sea temperatures. The seasonal tidal pattern in the northern Gulf of California moderates summer heating but accentuates winter cooling thus favoring winterkills. This intertidal fish community, dominated by reselected species, is more physically controlled than biologically accomodated. The temperate species play an important role in regulating the stability of this fish assemblage. (Katz)
W76-09126

CIRCULATORY ADAPTATIONS TO THE OXYGEN MINIMUM LAYER IN THE BATHYPELAGIC MYSID GNATHOPHAUSIA INGENS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
B. W. Belman, and J. J. Childress.
Biological Bulletin, Vol. 150, p. 15-37, February, 1976. 7 fig., 4 tab., 49 ref.

Descriptors: *Monitoring, Crustacenas, Animal physiology, Analytical techniques, Circulation, *Oxygen requirements, *Respiration, Dissolved oxygen, Environmental effects, Oxygen, Laboratory tests, Water pollution effects, *Pollutant identification.
Identifiers: Gnathophausia ingens, *Mysids, Cardiac output, Blood pressure, Anatomy.

Blood pressure and velocity were monitored in order to analyze the circulatory dynamics of Gnathophausia ingens a mysid which can survive in water containing less than 0.5 ml/l oxygen. The anatomy of the circulatory system varies from other crustacea in that the heart and arterial channels are proportionately larger. Gill surface areas of G. ingens range from 5-15 square centimeters per gram wet body weight, which is as large as the gill surface area of much larger crustaceans. The circulation of blood in G. ingens, when compared to other crustaceans on the basis of minute volume, cardiac output and turnover time, is highly effective. This effectiveness explains the unique ability to remove large percentages of the available oxygen while moving large volumes of water over the gills. (Katz)
W76-09128

MACROSCOPIC BENTHIC FAUNA OF THREE TIDAL CREEKS ADJOINING THE RHODE RIVER, MARYLAND,
Geological Survey, Edgewater, Md.
For primary bibliographic entry see Field 5B.
W76-09143

RESULTS OF PHYTOPLANKTON SAMPLING AT NATIONAL STREAM QUALITY ACCOUNTING NETWORK STATIONS IN MONTANA--1975 WATER YEAR,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 5A.
W76-09146

IDENTIFICATION OF NITROGEN AS A GROWTH-LIMITING NUTRIENT IN WASTEWATERS AND COASTAL MARINE WATERS THROUGH CONTINUOUS CULTURE ALGAL ASSAYS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W76-09195

PERSISTENCE OF FECAL COLIFORM INDICATOR BACTERIA ON ALFALFA IRRIGATED WITH MUNICIPAL SEWAGE LAGOON EFFLUENT,
Department of Agriculture, Lethbridge (Alberta). Research Station.
R. G. Bell.
Journal of Environmental Quality, Vol. 5, No. 1, p 39-42, January/March, 1976. 3 tab, 13 ref.

Descriptors: *Coliforms, *Fertilization, *Waste disposal, Sewage disposal, Irrigation, Alfalfa, Bacteria, Lagoons, Municipal wastes, Bioindicators, Water pollution effects.
Identifiers: *Land application.

A study to determine the survival time of fecal coliforms on alfalfa fertilized with sewage was undertaken. Alfalfa in a test plot was irrigated with sewage, and the populations of fecal coliforms found in the alfalfa samples were determined in the laboratory. Ten hours of bright sunlight completely destroyed the fecal coliforms. Their numbers did not decrease under damp, cool, overcast conditions. If sewage treatment failures occurred while sewage effluent was being used to irrigate alfalfa, two sunny days between irrigation and consumption of forage would adequately protect livestock from possible infection. (Snyder-FIRL)
W76-09217

HEPATITIS ATTRIBUTED TO POLLUTED STREAM,
Pierce County Health Dept., Tacoma, Wash.
L. Chapman.
Journal of Environmental Health, Vol. 38, No. 4, p 238-241, January-February, 1976. 1 fig.

Descriptors: *Epidemiology, *Public health, Diseases, Environmental sanitation, Water pollution, Water pollution sources, Water pollution effects, Storm sewers, Washington, *Human diseases.
Identifiers: *Hepatitis.

Various epidemiological factors were studied in connection with an outbreak of Hepatitis-A in Salishan, Washington. The most affected group was schoolchildren; the second most affected was adults 25 to 34 years of age. Food sources, water supply, and rodent control at the local elementary school were investigated. The area was compared to two control tracts and another subsidized housing area. Water samples from a local stream were analyzed. No sources were found at the school itself. The incidence of hepatitis was much less in the control tracts, and the youngest case in the control tracts was 18 yr of age. No widespread hepatitis outbreaks were known to have occurred in other subsidized housing areas. Therefore poor hygienic conditions alone did not appear to have caused the outbreak. Water samples indicated pollution with coliform bacteria, and the ratio of coliform to strep bacteria suggested human sewage. The concentration of hepatitis cases along the drainage area of the stream and the popularity of the stream among children as a play area further helped to identify the stream as the source of infection. Storm drains empty into the stream, and it is believed that the stream becomes contaminated during periods of heavy runoff when runoff water is contaminated with sewage that cannot be absorbed by the soil. Immediate measures recommended include public notice of the polluted nature of the stream and a personal hygiene campaign at the local elementary school. Sewers should be constructed in the area, and storm sewer runoffh should be treated along with other sewage. (Snyder-FIRL)
W76-09220

THE APPLICATION OF THE SCANNING ELECTRON MICROSCOPE TO FRESHWATER PHYTOPLANKTON TAXONOMY AND MORPHOLOGY,
Max-Planck-Institut fuer Limnologie zu Ploen (West Germany).
For primary bibliographic entry see Field 5A.
W76-09225

THE REPLICATION OF BIOLOGICAL EVENTS IN ENCLOSED WATER COLUMNS,
British Columbia Univ., Vancouver. Inst. of Oceanography.
M. Takahashi, W. H. Thomas, D. L. R. Seibert, J. Beers, and P. Koeller.
Archiv fur Hydrobiologie, Vol. 76, No. 1, p. 5-23, 1975. 10 fig., 2 tab., 27 ref.

Descriptors: *Marine algae, *Spatial distribution, *Biological communities, *Life history studies, Water analysis, Canada, Time series analysis, Productivity, Biomass, On-site tests, Population, Bays.
Identifiers: *Patricia Bay(British Columbia).

In an attempt to explain the patchiness of plankton in oceans life histories of water columns separated from normal advection and turbulence, four

seventy-ton water columns were isolated in plastic containers in Patricia Bay, Vancouver, B.C. These containers permitted simultaneous examination of herbivorous and carnivorous autotrophs, heterotrophs, and small phagotrophs. Their biology followed a similar sequence of events for thirty days and was similar to events in the water outside. Although absolute parameter values differed on a particular date at a particular depth, useful information was obtained from time sequence data. Species and biomasses changed due to temporal succession and did not show temporal heterogeneity. The indication is that small-scale patchiness in the ocean is due to physical processes. Seasonal trends in oceans are only valid if observations are made over periods 2-3 times the generation time of the organism studied. Changes in primary and secondary producers were more significant than differences in absolute production. Most nutrients decreased in and out of the containers, but ammonia increased within the containers. Phytoplankton populations were dominated first by microflagellates, then by Thallassiosira, and later flagellates. In neritic waters Thalassiosira was important in the biomass, but dominance was shared by other diatoms. Containers can be used to study interaction of organisms in their natural state or the effects of perturbations. (Buchanan-Davidson--Wisconsin).
W76-09226

PHASE I: AREA DESCRIPTION,
Gulf Coast Research Lab., Ocean Springs, Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09239

PHASE IV: BIOLOGY,
Gulf Coast Research Lab., Ocean Springs. Miss. Fisheries Section.
For primary bibliographic entry see Field 2L.
W76-09242

TEMPERATURE, OXYGEN, AND NUTRIENT DISTRIBUTION PATTERNS IN LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W76-09262

OXYGEN DEPLETION IN THE CENTRAL AND EASTERN BASINS OF LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 3, p 512-519, March 1976. 1 fig, 2 tab, 10 ref.

Descriptors: *Dissolved oxygen, *Lake Erie, *Oxygen, *Model studies, *Great Lakes, Density stratification, Mixing, Self-purification, Thermocline, Biochemical oxygen demand, Water quality, Phosphorus, Nutrients, Surface waters, Lakes, Hydrodynamics, Reaeration, Heat budget.
Identifiers: *Oxygen depletion rate, Oxygen transport, Mesolimnion erosion model, Mesolimnion exchange model, Anoxic conditions.

The hypolimnetic oxygen depletion rate is required to be measured to an accuracy of approximately 3% if major changes in the trophic state of Lake Erie are to be documented within about 5 yr of the change commencing. Depletion rate measurements of this level of accuracy require a knowledge of the reoxygenation of the Central and Eastern basin hypolimnia and the transport of oxygen between the hypolimnia. A model was described here that enables an estimate of the degree of hypolimnetic reoxygenation to be made. The transport of oxygen between the hypolimnia was estimated by means of a hydrodynamic model. The resultant calculations gave areal hypolimnetic depletion rate values of 0.43 and 0.87 g 02/sq m/day for the Central and Eastern basins, respectively, and volumetric depletion rates of 0.13 and 0.057 g 02/cu m/day, respectively, for these basins during 1970. (Henley-ISWS)
W76-09263

HEAVY METALS IN THE AQUATIC ENVIRONMENT.
For primary bibliographic entry see Field 5B.
W76-09272

WOOD PRESERVATIVES: THEIR DEPLETION AS FUNGICIDES AND FATE IN THE ENVIRONMENT,
Canadian Forest Service, Ottawa (Ontario). Eastern Forest Products Lab.
For primary bibliographic entry see Field 5B.
W76-09275

STUDY TO DEFINE CHANGES IN PULP MILL EFFLUENT-CONTRIBUTED COLOR IN RECEIVING WATERS DETECTABLE BY HUMAN OBSERVERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. C. Whittemore, and J. J. McKeown.
NCASI Stream Improvement Technical Bulletin no. 283, 160 p, December, 1975. 18 fig, 125 ref, 100 tab.

Descriptors: *Color, *Natural streams, *Pulp wastes, *Water pollution effects, Water pollution sources, Wastes, Industrial wastes, Water quality, Physical properties, Water analysis, Organoleptic properties, Water pollution, Water properties.

The ability of human observers to detect changes in the color of natural waters due to kraft mill effluents was studied. Factors affecting the perception of color changes included the baseline color, illumination intensity, the direction of color change, and the sensitivity and color memory of the observer. In general, increases of 20 and 40 color units in the field were perceived by 50 and 90% of the observers, respectively. The ability to detect decreasing changes was somewhat less. Subjects for further research are discussed. (Buchanan-IPC)
W76-09276

ACUTE TOXICITY TO JUVENILE RAINBOW TROUT (SALMO GAIRDNERI) OF NATURALLY OCCURRING INSECT JUVENILE HORMONE ANALOGUES,
B. C. Research Ltd., Vancouver.
J. M. Leach, A. N. Thakore, and J. F. Manville.
Journal of the Fisheries Research Board of Canada, Vol. 32, No. 12, p 2556-2559, December, 1975. 1 fig, 9 ref, 2 tab.

Descriptors: *Rainbow trout, *Toxicity, *Insect attractants, Water pollution effects, Bioassay, Fish, Aquatic animals, Juvenile fish, Pollutants, Lethal limit, Poisons.
Identifiers: Delta(4')-dehydrojuvabione, Juvabione, Hormones.

Median lethal concentrations (LC50) of four insect juvenile hormone analogues for juvenile rainbow trout were measured in bioassays with 4-hr solution renewal. The most toxic compound tested was delta(4')-dehydrojuvabione, with a 48-hr LC50 of 1.4 mg/liter and an estimated 96-hr LC sub 50 of approximately 0.8 mg/liter. Juvabione, epimeric mixtures of dihydrojuvabiones, and epimeric mixtures of juvabiols had 96-hr LC sub 50's of 1.5, 1.8, and 2.0 mg/liter, respectively. All fish, including those that survived for 96 hr, became lethargic soon after exposure to solutions of the insect juvenile hormone analogues, and their skins darkened. The toxicants were unstable in aqueous solution. (Witt-IPC)
W76-09282

THE BENTHOS OF PICTOU HARBOR AND NORTHUMBERLAND STRAIT, CANADA -- A MEASURE OF THE IMPACT OF TREATED KRAFT PULP MILL EFFLUENT,
Institute of Paper Chemistry, Appleton, Wis.
D. L. Rades.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P. Q.), p 39-44. 9 fig, 10 ref, 1 tab.

Descriptors: *Benthos, *Pulp wastes, *Water pollution effects, Industrial wastes, Wastes, Water pollution sources, Aquatic environment, Waste disposal, Waste water disposal.
Identifiers: *Pictou Harbor(Canada), *Northumberland Strait(Canada), *Kraft mills, East River(Canada).

Biological studies of Pictou Harbor and Northumberland Strait were conducted before and after a 600 ton/day bleached kraft pulp mill was constructed by Scott Maritimes Pulp Ltd. at Abercrombie Point. Premill studies indicated a poor environmental quality in the upper East River, an intermediate quality in the lower East River and in Pictou Harbor, and a high quality environment in Pictou Road and Northumberland Strait. Through six annual studies the discharge of treated pulp mill effluent was found not to impair environmental quality. (Witt-IPC)
W76-09294

CHEMICAL CHARACTERISTICS, ACUTE TOXICITY AND DETOXIFICATION OF FOAM IN TWO AERATED LAGOONS,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Sweltzer Creek Salmon Research Lab.
J. A. Servizi, R. W. Gordon, I. H. Rogers, and H. W. Mahood.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P. Q.), p 45-52. 3 fig, 26 ref, 7 tab.

Descriptors: *Pulp wastes, *Foam fractionation, *Toxicity, *Sockeye salmon, Biological treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution, Fish, Fishkill, Aerated lagoons, Water quality, Water chemistry, Water pollution effects.
Identifiers: *Kraft mills, Resin acids, Diterpenes, Dispersants, Wood extractives.

Foam from two aerated lagoons treating bleached kraft mill effluents was highly toxic to juvenile sockeye salmon (Oncorhynchus nerka). Chemical fractionation of one foam revealed large amounts of resin acids and neutral diterpenes. In the other foam, toxicity was related to a pitch dispersant and unidentified substances. Neither foam was readily detoxified by biological treatment. (Witt-IPC)
W76-09295

EFFECTS OF COLOR AND TOXIC CONSTITUENTS OF BLEACHED KRAFT MILL EFFLUENT ON ALGAL GROWTH,
B. C. Research Ltd., Vancouver.
R. N. Soniassy, J. C. Mueller, and C. C. Walden.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975. Preprinted Proceedings (Montreal, P.Q.), p 85-91. 8 fig, 16 ref, 2 tab.

Descriptors: *Pulp wastes, *Color, *Toxicity, *Algae, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Hydrogen ion concentration, Activated sludge, Microorganisms, Algal poisoning, Biological treatment.
Identifiers: *Kraft mills, Abietic acid.

Bleached kraft mill effluent was either adjusted to pH 7.5 and filtered through a glass fiber filter or was adjusted to pH 7.0 and centrifuged at 10,000

rpm for 15 minutes, to remove suspended solids. Biotreatment involved 24 hr retention in an activated sludge system. Using an incubation system where the effects due to color and to toxic substances could be separated, it was found that the color of bleached kraft mill effluent significantly reduced the light energy and consequently lowered algal (Selenastrum capricornutum) growth rates and productivity. Reduction of the light intensity by 40%, from 260 to 155 ft-candles, reduced the maximum productivity by 79%. There are unidentified substances other than color in the effluent, which even after 50-fold dilution, still inhibit algal growth. Reductions of up to 30% in productivity were observed on addition of 2% effluent to algal growth substrates. These toxicants are resistant to biodegradation and are not removed by biotreatment. Abietic acid was not responsible for the toxic effect of the effluent. Its toxic threshold to the alga is about 5 mg/liter, a level unlikely to occur in receiving water systems. (Witt-IPC)
W76-09300

ECOLOGICAL EFFECTS OF OFFSHORE CONSTRUCTION,
Marine Science Inst., Bayou La Batre, Ala.
For primary bibliographic entry see Field 6G.
W76-09307

PROCEEDINGS OF JOINT CONFERENCE ON PREVENTION AND CONTROL OF OIL SPILLS, MARCH 13-15, 1973, WASHINGTON, D.C.,
American Petroleum Inst., Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-09312

PETROLEUM RESIDUES IN THE SARGASSO SEA AND ON BERMUDA BEACHES,
Bermuda Biological Station for Research, St. George's West.
B. F. Morris, and J. N. Butler.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D. C., March 13-15, 1973. p 521-529, 8 fig, 1 tab, 29 ref.

Descriptors: *Continental Shelf, *Oil spills, *Oil pollution, *Water pollution effects, *Environmental effects, Beaches, Fossil fuels, Assessments, Atlantic Ocean, Water pollution sources.
Identifiers: *Outer Continental Shelf, *Petroleum, Tar lumps, Tar balls, Environmental impact, Tankers, Residues, Sargasso Sea, Bermuda.

Petroleum residues ('tar lumps') are found throughout the Atlantic Ocean. An estimate of the current standing stock of tar in the Northwest Atlantic is 86,000 metric tons, of which 66,000 tons are found in the Sargasso Sea. Although there are wide seasonal variations, the amount observed near Bermuda has not increased significantly from 1971 to 1972. Beach deposits also undergo wide variations (4g/m to 1700 g/m), and seem to act, on the average, as collectors of tar from a strip of water about 20 km wide. Chemical characteristics of tar lumps (analyzed by gas chromatography) vary widely, but almost all have distinctive paraffinic wax components in the C30 to C40 range, implying that their origin is in crude oil sludge from tanker washings. The standing stock is probably between 20 to 50 percent of the total annual influx of petroleum from this source. Degradation of tar lumps at sea, after rapid losses by evaporation and dissolution, takes times of the order of years, probably because of their substantial content of high-melting point waxes and asphaltenes. This paper presents new quantitative results for the amounts of tar in the Sargasso Sea and the Northwestern Atlantic Ocean, a quantitative assessment of tar on representative beaches in Bermuda over a period of nearly a year, and information on the chemical and physical characteristics of the tar found both at sea and on the beaches, suggesting the principal source of these residues. (See also W76-09312) (Sinha-OEIS)
W76-09315

SIMULATION OF MOVEMENT OF OIL SLICKS IN THE STRAIT OF GEORGIA USING SIMPLE ATMOSPHERE AND OCEAN DYNAMICS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
T. S. Murty, and M. L. Khandekar.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973, p 541-546, 4 fig, 1 tab.

Descriptors: *Continental shelf, *Oil spills, *Oil pollution, *Water pollution effects, *Environmental effects, Straits, Currents(Water), Wind, Tidal effects.
Identifiers: *Outer Continental Shelf, *Environmental effect, Tankers, Oil slicks, Groundings, Collisions, Canada West Coast, Strait of Georgia.

The Strait of Georgia is a complex water body on the west coast of Canada. The location shown as Cherry Point is on a tanker route and it is estimated that about 1.2 million tons of crude oil would be transported along this route during 1972-74 and this figure could increase to an annual eight million tons by 1975. There already have been a few minor oil spills in this large water body due to either grounding or collision and should a large spill occur, it will be a formidable task to predict its movement. Hydrodynamical techniques were used to investigate the movement of oil slicks in the Strait of Georgia by assuming that the oil moves with the current and not with the wind. The divergence of the isobaths near Alden Bank probably makes the current branch while that southeast of Pt. Roberts narrows and intensifies the current. The effect of mutual interaction among several slicks both with and without a steering current such as a tidal or wind-generated current is found to be important in determining their trajectories. For oils with large viscosities, an oscillatory tidal current could give rise to an unstable situation in which the oil spreads in the form of long lines radiating out from the spill similar to the spokes in a bicycle wheel. Stratification of the water causes the oil plume to bifurcate and due to this phenomena, even if one branch of the plume carrying the oil goes away from the coast, the second branch carries oil to the coast. (See also W76-09312) (Sinha-OEIS)
W76-09316

TOXICITY AND AVOIDANCE TESTS WITH PRUDHOE BAY OIL AND PINK SALMON FRY,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Fisheries Lab.
S. D. Rice.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 667-670, 2 fig, 1 tab, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Water resources, *Environmental effects, Continental shelf, Toxicity, Salmon, Migration, Resources development, Alaska.
Identifiers: *Outer Continental Shelf, Prudhoe Bay(AK), Pink salmon fry, Onchorhynchus gorbuscha, Terminals, Crude oil, Environmental impact.

The development of the oil industry at Prudhoe Bay, Alaska, could adversely affect the State's fishery resources through pollution. The fry of pink salmon (Onchorhynchus gorbuscha) from several streams pass through Port Valdez and on through Prince William Sound on their oceanward migration. To provide a basis for predicting some of the potential effects of oil pollution to the fry (and ultimately to the salmon stocks) during this migration, the author determined the acute toxicity of Prudhoe Bay crude oil to pink salmon fry and also the concentrations of the oil that the fry would avoid in both fresh water and seawater. The tests were conducted at the National Marine Fisheries Service Auke Bay Fisheries Laboratory. Bioassays indicate that older pink salmon fry held in seawater at high temperatures are more susceptible to oil toxicity than younger fry held at lower temperatures. Laboratory avoidance experiments show that pink salmon fry are able to detect low sublethal concentrations of oil. It is not known what the effect of sublethal concentrations of oil on salmon migrations will be, but the potential for harm is clear. (See also W76-09312) (Sinha-OEIS)
W76-09317

A SALT MARSH MICROCOSM: AN EXPERIMENTAL UNIT FOR MARINE POLLUTION STUDIES,
Edison Water Quality Research Lab., N.J.
R. J. Nadeau, and T. H. Roush.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 671-683, 15 fig, 15 ref.

Descriptors: *Salt marshes, *Water pollution effects, *Water quality, *Grasses, *Oil spills, *Oil pollution, Environmental effects, Resources development, Coasts, Continental shelf, Ecosystems, Invertebrates.
Identifiers: *Outer continental shelf, Microcosm, Spartina alterniflora, Spartina patens, Distichlis spicata, Hydrocarbons, Environmental impact.

A salt marsh microcosm was established and monitored to assess its applicability as a water pollution research tool toward determining the impact of oil spills upon coastal salt marshes. Growth of the major grass species was a measure of similarity between a nearby native salt marsh and the microcosm. No significant differences in growth were observed in low (Spartina alterniflora) high marsh (Spartina patens and Distichlis spicata) species during most of the growing season. Gas chromatography, ultraviolet and fluorescent spectrophotometry were used to monitor the fate of oil released into one side of the microcosm. High boiling range hydrocarbons probably of biogenic origin, interfered with quantification by ultraviolet and fluorescent spectroscopy, but could be separated by gas chromatography for qualitative examination. Salt marsh microcosms can be easily used for studying the fate and effects of pollutants through a program of careful observation and monitoring. (See also W76-09312) (Sinha-OEIS)
W76-09318

MICROBIAL ECOLOGY OF PETROLEUM UTILIZATION IN CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, and R. R. Colwell.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 685-690, 2 fig, 5 tab, 35 ref.

Descriptors: *Oil pollution, *Oil spills, *Water pollution effects, *Environmental effects, Continental shelf, Ecology, Actinomycetes, Microbial degradation, Chesapeake Bay, Microorganisms, Assessments.
Identifiers: *Outer Continental Shelf, *Superports, Tankers, Terminals offshore technology, Petroleum, Baltimore Harbor, Hydrocarbons, Substrates, Baseline data, Cladosporium resinae, Environmental impact.

Chesapeake Bay is the largest and most important estuary, with respect to aquatic fauna, in the mid-Atlantic coastal area. Since 90% of the pollution of water and waterways is, in fact, oil pollution and because construction of superports for oil tankers is being considered for Chesapeake Bay, assessment of the microbial potential for degradation of

petroleum in Chesapeake Bay is both important and timely. Baseline data on the natural microbial flora are necessary if and when effects of oil on biological communities are to be determined. Analysis of water and sediments collected at two stations in Chesapeake Bay demonstrated four to five times the concentration of petroleum in an oil polluted site in Baltimore Harbor compared with the station in Eastern Bay which served as a control. The numbers of petroleum-degrading microorganisms, measured by direct and replica plating, in the water and sediment samples were related to the concentration of oil in each sample. Total yields of petroleum-degrading microorganisms grown on an oil substrate were greater for those organisms exposed to oil in the natural environment. Microorganisms isolated from an oil-contaminated environment produced cell yields under 'natural' conditions, i.e., laboratory simulation of growth conditions in the natural environment, which equaled the yields of microorganisms which had not been previously exposed to oil and were grown under optimum conditions. Microorganisms isolated from water and sediment samples collected in Baltimore Harbor grew on substrate representative of the aliphatic, aromatic and refractory hydrocarbons. (See also W76-09312) (Sinha-OEIS)
W76-09319

EFFECTS OF SEAWATER EXTRACTS OF CRUDE OIL ON CARBON BUDGETS IN TWO SPECIES OF MUSSELS,
Massachusetts Univ., Gloucester.
E. S. Gilfillan.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 691-695, 6 fig, 7 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Assessments, *Environmental effects, Continental shelf, Mussels, Mollusks, Salinity.
Identifiers: *Outer continental shelf, Environmental impact, Crude oil, Carbon budgets, Filter feeders, Hydrocarbons, Blue mussle, Mytilus edulis, Marsh mussel, Modiolus demissus.

The combined effects of crude oil and salinity stress on the carbon budget of two common filter feeding molluscs, Mytilus edulis (the blue mussel) and Modiolus demissus (the marsh mussel) are reported. Carbon budgets have been calculated for each species under a variety of combination of oil content and salinity. Both reduced salinity and crude oil tend to decrease the net carbon balance for each species; stresses from each source were additive in their effects on experimental animals. Although similar responses to oil were shown by each species, Mytilus appeared to be somewhat more resistant to oil than Modiolus. (See also W76-09312) (Sinha-OEIS)
W76-09320

THE TOXICITY OF CRUDE OIL AND ITS COMPONENTS TO FRESHWATER ALGAE,
Toronto Univ. (Ontario). Dept. of Botany; and Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
P. Kauss, T. C. Hutchinson, C. Sota, J. Hellebust, and M. Griffiths.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 703-714, 11 fig, 6 tab, 23 ref.

Descriptors: *Algae, *Phytoplankton, *Toxicity, *Oil spills, *Oil pollution, *Water pollution effects, *Environmental effects, Continental Shelf, Freshwater, Photosynthesis.
Identifiers: *Outer Continental Shelf, Crude oil, Naphthalene Hydrocarbons, Environmental impact, Chlorella vulgaris, Chlamydomonas angulosa.

Field and laboratory experiments were conducted to determine the toxicity of crude oil to freshwater algae. In the field, experiments were continued for a two year period and changes in the abundance and species composition of phytoplankton tabulated. Species were found to differ markedly in their response to an oil spill--varying from considerable suppression of growth to stimulation. In the laboratory, the effects of aqueous extracts of seven crude oils on a selected test species, Chlorella vulgaris, were determined. Marked differences in toxicity, as indicated by reduced growth, were found to exist between oils. Work with oil extracts of different ages suggests that the short-term toxicity of oils is due to the rapid loss of volatile compounds. Differences in the toxicity of selected aromatic components of crude oils--benzene, toluene, o-xylene and naphthalene--were observed and are believed to relate to an increase in methylation. Aqueous crude oil and naphthalene depressed the 14C-NaHC03 uptake (i.e. photosnythesis) of Chlamydomonas angulosa. 14C-naphthalene was rapidly taken up by Chlamydomonas cells. However, release of this compound was much slower, and in unwashed cells, seemingly dependent upon cell division. Possible mechanisms of crude oil toxicity are discussed. (See also W76-09312) (Sinha - OEIS)
W76-09321

BIOLOGICAL EFFECTS OF REFINERY EFFLUENTS,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
J. M. Baker.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 715-723, 3 fig, 3 tab, 26 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Environmental effects, *Toxicity, Continental Shelf, Ecosystems, Oil industry, Assessments, Bioassay.
Identifiers: *Outer Continental Shelf, *Refinery wastes, Oil refineries, Biological effects, Environmental impact.

Refinery effluents contribute an estimated 300,000 tons of oil per year to the sea, but the biological effects of continuous but low concentrations of oil and other compounds are not well known. Different approaches to the problem are described, and field and laboratory results summarized. Different ecosystems differ in their capacity to receive and degrade effluents, and speed of dispersion and dilution is a major factor determining amount of biological damage. Changes in distribution and abundance of species are often very localized and in some cases may result from behavioural responses rather than direct toxic effects; areas of influence in terms of sub-lethal absorption of oil or other effluent constituents are not yet known. Biologically acceptable limits for effluents will vary considerably between sites and do not necessaryily correspond with the present somewhat arbitrary restrictions. (See also W76-09312) (Sinha - OEIS)
W76-09322

RESPIRATORY RESPONSE OF JUVENILE CHINOOK SALMON AND STRIPED BASS EXPOSED TO BENZENE, A WATER-SOLUBLE COMPONENT OF CRUDE OIL,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Fisheries Lab.
R. W. Brocksen, and H. T. Bailey.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 783-791, 7 fig, 2 tab, 17 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution effects, *Toxicity, Respiration, Fish, Salmon, Bass, Continental Shelf.
Identifiers: *Outer Continental Shelf, Benzene, Crude oil, Hydrocarbons, Aromatic hydrocarbons, Narcosis, Chinook salmon, Oncorhynchus tshawytscha, Striped bass, Morone saxatilis.

Interest surrounding the potential effects of crude oil on aquatic organisms has increased in recent years due to the incidence of accidental oil spills. There are few experimental results reported, however, dealing with the effect on aquatic species of water-soluble aromatic hydrocarbons contained in crude oil. Such compounds are highly toxic to mammals. Experiments were conducted using juvenile chinook salmon, Oncorhynchus tshawytscha, and striped bass, Morone saxatilis. The fish were exposed to sub-lethal concentrations of the aromatic hydrocarbon benzene, for periods ranging from 1-96 hours. Prior to exposure, and after exposure to the benzene, respiration rates of individual fish were measured. Results show increases in respiratory rate up to 115 percent above that of control fish after exposure periods of 24 hours for striped bass and 48 hours for chinook salmon. Fish exposed to benzene concentrations of 10 ppm for periods longer than those listed exhibited a narcosis that caused a decrease in respiratory rate. The narcotic state induced by exposure to benzene was shown to be reversible when the fish were placed in fresh water and kept for periods longer than 6 days. Possible biochemical mechanisms leading to this response are hypothesized. (See also W76-09312) (Sinha - OEIS)
W76-09323

INTERAGENCY INVESTIGATIONS OF A PERSISTENT OIL SPILL ON THE WASHINGTON COAST. ANIMAL POPULATION STUDIES, HYDROCARBON UPTAKE BY MARINE ORGANISMS, AND ALGAE RESPONSE FOLLOWING THE GROUNDING OF THE TROOPSHIP GENERAL M.C. MEIGS,
National Marine Fisheries Service, Seattle, Wash.
R. C. Clark,Jr., J. S. Finley, B. G. Patten, D. F. Stefani, and E. E. DeNike.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p 793-808, 12 fig, 5 tab, 18 ref.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution effects, Continental Shelf, Washington, Algae, Coasts, Crabs, Biota, Fossil fuels.
Identifiers: *Outer Continental Shelf, *Environmental impact, Groundings, Intertidal communities, Uptake, Hydrocarbons, Urchins, Strongylocentrotus purpuratus, Barnacles, Mitella polymerus, Hemigrapsus nudus, Fucus gardneri, General M.C.Meigs.

An interagency team of biologists, chemists, oceanographers and engineers investigated the long-term effects of oil spilled by the grounding of the troopship GENERAL M.C. MEIGS January 6, 1972, on an ocean coast intertidal community of plants and animals. Oil has continuously been released from the 440,000 liters of Navy Special Fuel Oil carried by the vessel. The team assessed biological damage by making surveys of abundance and physiological conditions of animals; qualitative evaluation of obvious damage to plants, and measurements of the hydrocarbon uptake in both plants and animals. A series of sites, forming a vertical profile of the rocky shelf area from the upper intertidal zone to the lowest low tide level in Wreck Cove, have been studied. This report describes the preliminary findings of the first ten months (January-October, 1972) of the investigation. Abnormal and dead urchins (Strongylocentrotus purpuratus) indicated that this species was affected. Loss of fronds and bleached thalli not evident in control areas were observed in the plant community in the immediate vicinity of the hulk. Petroleum hydrocarbons were taken up in the intertidal community. The normal paraffin hydrocarbon patterns and content over the range n-C14H30 to nC37H76 of healthy-appearing goose barnacles (Mitella polymerus), crabs

(Hemigrapsusnudus) and an alga (Fucus gardneri) display the same basic characteristics as the fuel oil which had been lost from the GENERAL M.C. MEIGS. (See also W76-09312) (Sinha - OEIS)
W76-09324

EFFECTS OF WATER SOLUBLE EXTRACTS OF OIL ON PHYTOPLANKTON,
New York Ocean Science Lab., Montauk.
R. Nuzzi.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, DC, March 13-15, 1973. p. 809-813, 3 fig, 2 tab, 14 ref.

Descriptors: *Environmental effects, *Water resources, *Water pollution effects, *Oil pollution, Phytoplankton, Toxicity, Continental Shelf.
Identifiers: *Outer Continental Shelf, Exenic cultures, New York Bight, Environmental impact.

Methods routinely employed in the cleanup of oil spills generally are intended to remove the oil to the level of invisibility, at which point it has been considered by many to be harmless or its effects negligible. This paper presents evidence indicating that soluble constituents of No. 2 fuel oil are toxic to phytoplankton cultured axenically and also exert an effect on natural phytoplankton populations. Although there has been a good deal of work investigating the effects of oil and oil products on organisms such as benthic invertebrates, finfish and birds, there have been few papers dealing with the effects of oil on phytoplankton. Most papers on this topic refer to the combined effects of oil and oil dispersing agents. With this in mind, the author attempted to determine the effects of water soluble materials from various types of oil on the growth of marine phytoplankton, without the addition of emulsifying agents. (See also W76-09312) (Sinha - OEIS)
W76-09325

EFFECT OF A BUNKER FUEL ON THE BEACH BACTERIAL FLORA,
California Univ., Berkeley. School of Public Health.
A. B. Cobet, and H. E. Guard.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D.C., March 13-15, 1973. p 815-819, 4 tab, 9 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Oil pollution, Beaches, Flora, Bacteria, Continental Shelf.
Identifiers: *Outer Continental Shelf, Bunker fuel, Petroleum, San Francisco Bay, Bacterial flora.

Following the Chevron bunker fuel spill in San Francisco Bay in January 1971, a study to follow the fate and effect of the residual oil was undertaken. The primary removal process of the fuel was by standard cleanup operations using straw and sand removal from the beaches. However, an unknown quantity of the fuel remained dispersed within the beach sand. It is this remaining portion of the fuel that was studied and its effect on the beach bacterial flora described. Studies at four sampling locations on three beaches in the San Francisco area affected by oil from an 840,000 gallon spill have shown that the size of the bacterial population and distribution of bacterial genera within the beach was unaffected by the petroleum hydrocarbons remaining in the beach sand after completion of the cleanup operation. Only 15 percent of the beach bacteria were affected by a variety of petroleum components including the pentane soluble fraction of the bunker fuel. (See also W76-09312) (Sinha-OEIS)
W76-09326

MICROBIAL PETROLEUM DEGRADATION: THE ROLE OF CLADOSPORIUM RESINAE,
Dayton Univ., Ohio. Dept. of Biology.
J. D. Walker, L. Cofone, Jr., and J. J. Cooney.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D.C., March 13-15, 1973. p 821-825, 2 fig, 2 tab, 16 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Oil pollution, *Microbial degradation, Fungi, Pesticides, Continental Shelf.
Identifiers: *Outer Continental Shelf, Hydrocarbons, Petroleum, Aromatic hydrocarbons, Aliphatic hydrocarbons, Cladosporium resinae.

Cladosporium resinae is probably the most prevalent hydrocarbon-utilizing fungus. It has been isolated in fresh water and marine environments. It utilizes aliphatic and aromatic hydrocarbons, as well as alcohols and acids. Growth on aliphatic hydrocarbons is slow, and yields are lower than for cells cultured on acids. However, degradation of hydrocarbons is not slow, since most of the hydrocarbon is mineralized (converted to CO2) and not assimilated to cellular carbon. Growth of the fungus was not supported by organo-phosphorus, chlorinated hydrocarbon, or natural pesticides as sole carbon source. However, the fungus was resistant to or stimulated by high concentrations of these pesticides when cultured on hydrocarbons. This suggests that high concentrations of pesticides occurring in oil slicks would not inhibit oil degradation by Cladosporium resinae. Comparison of hydrocarbon oxidation by whole cells and cell-free preparations revealed the presence of an efficient cell-free oxidizing system. The pathway of hydrocarbon oxidation has been reported for hydrocarbon-utilizing bacteria and yeasts but not for fungi. Temperature, pH and coenzyme requirements were determined for the oxidation of hydrocarbons by C. resinae. Isolation of intermediates and results of experiments utilizing electron transport inhibitors support the conclusion that in C. resinae alkanes are oxidized to their homologous alcohol, aldehyde and acid. The range of hydrocarbon substrates degraded by constitutive enzymes of Cladosporium resinae coupled with the ability to degrade hydrocarbons in the presence of high concentrations of pesticides suggests that C. resinae may be one of the most important microorganisms capable of degrading oil in the natural environment. (See also W76-09312) (Sinha-OEIS)
W76-09327

THE FATE OF A BUNKER FUEL IN BEACH SAND,
California Univ., Berkeley. School of Public Health.
H. E. Guard, and A. B. Cobet.
In: Prevention and Control of Oil Spills, Proceedings of Joint Conference, Washington, D.C., March 13-15, 1973. p 827-834, 7 fig, 2 tab, 7 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Oil pollution, *Oil spills, Beaches, Continental Shelf, Bacteria, Sands.
Identifiers: *Outer Continental Shelf, Bunker fuel, San Francisco Bay, Tankers, Collisions, Petroleum.

The dispersed oil concentrations in sand from three San Francisco area beaches have been measured over a 143 day period following an 840,000 gallon bunker fuel spill in San Francisco Bay. The dispersed oil remaining within the beaches after cleanup was extensively weathered while visible oil globules exhibited only minor weathering. Elevated levels of chloroform-extractable material were observed at two sampling locations following the spill. The background levels of chloroform-extractable materials determined from log-normal distribution analysis were ten-fold higher on bay beaches than on ocean beaches. Laboratory experiments indicated that in a beach system evaporation, dissolution, and microbial degradation combine to remove the lower molecular weight fractions of bunker fuel. A major effect of the beach is to disperse the oil. This dispersal has been shown to greatly enhance the effect of dissolution on the composition of bunker fuel. While the effect of exposure to water on the composition of a bunker fuel slick is minimal, significant amounts of the lower ends of bunker fuel (which is highly dispersed) in a sand column are removed by dissolution. (See also W76-09312) (Sinha-OEIS)
W76-09328

SIXTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 6-8, 1974, HOUSTON, TEXAS. PREPRINTS, VOLUME II,
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09333

BEACH-OFFSHORE DREDGING: SOME ENVIRONMENTAL CONSEQUENCES,
London Univ. (England).
For primary bibliographic entry see Field 5G.
W76-09335

ENVIRONMENTAL STUDIES FOR MAJOR OFFSHORE DEVELOPMENTS,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09336

ON SPENT SEMICHEMICAL PULPING LIQUORS. (4) XYLAN IN NEUTRAL SULFITE SEMICHEMICAL SPENT LIQUOR (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
O. Inada, K. Sameshima, and T. Kondo.
Japan Tappi, Vol. 29, No. 11, p 589-595, November, 1975. 6 fig, 14 ref, 7 tab. English summary.

Descriptors: *Sulfite liquors, *Pulp wastes, *Toxicity, *Fishkill, Suspended solids, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Lignins, *Water pollution effects, Water pollution, Hardwoods, Organic compounds, Carbohydrates, *Pollutant identification, Fish.
Identifiers: *Xylan, Xylose, Hemicellulose, Spent pulping liquors, Semichemical pulp mills, NSSC(Neutral sulfite semichemical) pulping, Polysaccharides.

An earlier study attributed the fishkill characteristics of spent NSSC liquor to the toxicity of suspended solids which, on hydrolysis, gave xylose and apparently originated in hardwood xylan. A further study was made of the fractional composition of this xylan-rich substance. Japanese birch, beech, hornbeam, and kapur (Dryobalanops) were cooked at 120-180 C with a liquor containing 12% sodium sulfite and 5% sodium carbonate (based on oven-dry chip weight) at a 3:1 liquor ratio. The spent liquor was evaporated to half its volume, allowed to stand for a day, then centrifuged, and the precipitate washed three times with ethanol and once with acetone. The resulting precipitate contained most of the toxic material and showed linear relations not only with the pentosan content of the chips but also with the organic content of the spent liquor and with the dwell time at maximum cooking temperature. The precipitate contained lignin in addition to xylan, whereas a similar precipitate obtained from white lauan consisted largely of lignin. Only about 50% of the xylan dissolved during NSSC cooks could be accounted for; the rest is probably converted to other substances difficult to determine by Somogyi's method. (Brown-IPC)
W76-09338

A LAKE POPULATION: THE INTHA OF LAKE INLE. (SOUTHERN SHAN STATES, BURMA), (IN FRENCH),
Ecole Pratique des Hautes Etudes, Paris (France).
For primary bibliographic entry see Field 2H.

W76-09361

EFFECTS OF SELECTED HERBICIDES ON BACTERIAL POPULATIONS IN NONTREATED AND TREATED WATER,
Clemson Univ., S. C. Dept. of Biochemistry; and Clemson Univ., S. C. Dept. of Botany.
O. Yazar, J. M. Shively, and N. D. Camper.
Water Resources Bulletin, Vol. 11, No. 2, p 294-299, April 1975. 1 fig, 3 tab, 4 ref.

Descriptors: *Bacteria, *Herbicides, Water supply, Water pollution, Water pollution effects, Water treatment, Eutrophication, Lakes.
Identifiers: Bacterial populations, *Diuron, *Dichlobenil, *Diquat.

Bacterial populations in nontreated and herbicide-treated waters were subjected to three different herbicides. Diuron, dichlobenil, and diquat were added (100 mg/l) to water samples from two fresh water lakes and two herbicide-treated ponds. Total numbers of bacteria were monitored. Bacterial populations in fresh lake water decreased after herbicide additions; however, final populations were significantly greater than the controls. Similar observations were recorded for bacteria in dichlobenil- and diuron-treated waters. Selective enrichment is probably expressed in these experiments. (Skogerboe -Colorado State)
W76-09369

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME III.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09374

EVALUATION OF MULTI-PURPOSE INDUSTRIAL-PORT ISLANDS: SEA ISLAND STRUCTURE ENGINEERING RESEARCH STUDY,
Harris (Frederick R.), Inc., New York.
For primary bibliographic entry see Field 5G.
W76-09375

OFFSHORE MULTI-USE PORT ISLANDS AND THEIR ENVIRONMENT,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5G.
W76-09376

EVALUATION OF SEISMICITY AND EARTHQUAKE SHAKING AT OFFSHORE SITES,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5G.
W76-09379

COMPARISON OF TWO METHODS FOR DETERMINATION OF PRIMARY PRODUCTIVITY ON COASTAL WATERS OF THE GULF OF MEXICO, (IN SPANISH),
Universidad Nacional Autonoma de Mexico City. Instituto de Biologia.
For primary bibliographic entry see Field 5A.
W76-09391

DISTRIBUTION, CIRCULATION AND EVOLUTION OF NUTRIENTS, PARTICULARLY INORGANIC PHOSPHORUS IN LAKE ETANG DEBERRE: INFLUENCE OF RIVER DURANCE WATERS, (IN FRENCH),
Centre Universitaire de Luminy, Marseille (France). Laboratoire d'Oceanographie.
For primary bibliographic entry see Field 5B.
W76-09393

DEGRADATION OF BUNKER C OIL UNDER DIFFERENT COASTAL ENVIRONMENTS OF CHEDABUCTO BAY, NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia)
For primary bibliographic entry see Field 5B.
W76-09394

SELF-PURIFICATION OF SMALL FRESH-WATER STREAMS: PHOSPHATE, NITRATE, AND AMMONIA REMOVAL,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.; and Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
For primary bibliographic entry see Field 5G.
W76-09398

MICROBIOLOGICAL AND ALGOLOGICAL SURVEY OF A PRIMARY STAGE OF EUTROPHICATION IN A STREAM, (IN FRENCH),
Nancy Univ. (France).
J. F. Pierre, and G. Kilbertus.
Bull Soc Bot Fr. 120(7/8), p 293-302, 1974.

Descriptors: *Microbiology, *Diatoms, *Eutrophication, Surveys, Bioassay, Oil, Pseudomonas, Bacteria, Algae, Streams.
Identifiers: *Algological, *Surveys, Bacillus.

A study was made of the consequences of a low level of petroleum on the quantity and quality of bacterial and algal flora. The presence in spots of some species of Pseudomonadaceae and Bacillus and various diatoms seems to be related to eutrophication by traces of petroleum.--Copyright 1975, Biological Abstracts, Inc.
W76-09399

LIMNOPLANKTON OF SOME INLAND WATERS OF DACCA CITY,
Dacca Univ. (Bangladesh). Dept. of Zoology.
N. G. Das, and A. L. Bhuiyan.
Bangladesh J Zool. 2(1), p 27-42, 1974.

Descriptors: *Plankton, *Ponds, *Lakes, Asia, Productivity, Correlation analysis, Rotifers, Copepoda, Crustaceans.
Identifiers: *Bangladesh, Dacca, Ostracod.

Species of planktonic organisms (57) including 25 rotifers, 14 cladocerans, 10 copepods and 8 ostracods were recorded from 2 ponds and 2 lakes of Dacca city Bangladesh. Identification keys to these plankters were prepared, of which 37 were identified up to species and 20 were identified up to genus. The greatest abundance of plankton was observed in the mo. of April-May and Oct., and the greatest depletion was observed in the mo. of Aug. and Jan.-Feb. A correlation of productivity and some of the physicochemical factors which influence productivity was studied.--Copyright 1975, Biological Abstracts, Inc.
W76-09400

5D. Waste Treatment Processes

BIOLOGICAL EFFECTS OF PRIMARY, SECONDARY, AND TERTIARY SEWAGE TREATMENT IN LOTIC ANALOG RECIPIENTS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5C.
W76-08792

ALGAL GROWTH POTENTIAL OF SIX NORWEGIAN WATERS RECEIVING PRIMARY, SECONDARY AND TERTIARY SEWAGE EFFLUENTS,
For primary bibliographic entry see Field 5C.
W76-08794

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
V. B. Youngner, T. E. Williams, and L. P. Green.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-253 770, $5.50 in paper copy, $2.25 in microfiche. California Water Resources Center, Davis, Contribution No. 157, April 1976. 104 p, 25 fig, 33 tab, 52 ref. (California Water Resources Center Projects UCAL-WRC-W-236/374). OWRT B-161-CAL (2), B-090-CAL (4), B-119-CAL (3), B-134-CAL (3) and B-158-CAL (2).

Descriptors: *Irrigation, *Physiological ecology, *Sewage effluents, Forest fires, *Water reuse, Recycling, *Nutrient cycling, Vegetation establishment, *Plant growth, *Vegetation regrowth, Water quality, Monitoring, *California, Brush, Fescues, Grasses, Soil analysis, Chaparral.
Identifiers: Maloney Canyon(Calif), *Greenbelt irrigation, Mullein.

Secondary treated sewage effluent was applied to uncleared, brush cleared, and type converted grass plots in a mountain chaparral ecosystem. The objectives were to investigate effluent effects on vegetation types in the selection of suitable species for greenbelt establishment and to determine effluent renovation and nutrient recycling characteristics of vegetation types and mountain soils. Results indicated that native brush (Ceanothus Greggii) under 3 1/2 inches per week irrigation had high fuel moisture but produced excessive growth. Under lesser irrigation, growth was reduced but fuel moisture levels were generally inadequate. Regrowth on brush cleared plots under the heavy irrigation was altered by mullein (Verbascum thapsus) proliferation. Introduced Alta fescue (Festuca arundinacea) flourished under high irrigation providing the best features of high fuel moisture with a low growing plant cover. Suction lysimeter monitoring of the soil solution at a 4-foot depth beneath irrigated grass plots indicated 42 to 99% removal of all effluent constituents except Ca, Mg, and Cl which increased in late season. Analysis of grass tissue indicated substantial removal of N, P , K, Cl, and S. Na, Cl, P, and B accumulated in the soil at the highest rates. No toxic buildup was evident. Stream and well monitoring within and surrounding the application site showed no indication of water quality degradation or contamination.(Snyder-California-Davis)
W76-08840

AVAILABILITY OF ALUMINUM PHOSPHATE FROM ALUM-TREATED WASTEWATER FOR ALGAL GROWTH,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. E. Francisco, B. A. Dempsey, and J. C. Matheson, III.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 797 $5.00 in paper copy $2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Report No. 111, May 1976. 82 p., 27 fig, 12 tab, 64 ref. OWRT A-075-NC(3), 14-31-0001-4033.

Descriptors: Phosphorus, *Nutrient removal, *Flocculation, *Coagulation, *Waste water treatment, Aquatic algae, Phosphorus compounds, Eutrophication, North Carolina, *Phosphates.
Identifiers: Alum-flocculated phosphate, *Phosphorus removal, *Algal growth, *Alum-treated wastewater, Aluminum phosphate.

For phosphorus removal from wastewater, alum coagulation-precipitation is often the removal method of choice. Typically, alum is added ahead of the final settling tank in a ratio of 1.8 aluminum to 1 phosphorus. At this ratio phosphorus precipitates as an AlPO4 complex associated with coagulated Al(OH)n species. While most (80-90%) of the phosphorus is removed by settling, some

carries over into the effluent. Only 10% of the carryover phosphorus is filterable; therefore 90% is in a particulate form. This research explored the availability of this particulate phosphorus in a pure chemical system, an open-channel, mixed-culture system (stream channel study), and a unialgal, batch-culture system (bioassay study). Results indicate that the amount of alum-flocculated phosphorus which becomes available nutrient is dependent upon pH, concentration, and dilution. As pH was increased the degree of undersaturation with respect to A1PO4 also increased. In all cases the concentration of total phosphorus was much greater than that of dissolved phosphorus but enough to allow excessive algal growth. Growth of the test alga, Selenastrum capricornutum was not inhibited by A1+3. When the concentration of total phosphorus (in alum-flocculated form) was 0.5 mg/1, growth was equivalent to that with an equivalent concentration as K2HPO4. However, when the total phosphorus (as alum-flocculated phosphate) was 0.186 mg/1 growth was less than that with an equivalent amount as K2HPO4. (Stewart - North Carolina State)
W76-08842

KINETICS AND MECHANISMS OF THE OXIDATIVE DEGRADATION OF NITRILOTRIACETIC ACID (NTA) IN AQUEOUS SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W76-08843

THE EFFECTS OF A SYNTHETIC CHILI WASTE ON BIOLOGICAL SEWAGE TREATMENT PLANT OPERATIONS,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
J. L. Gabbard, and W. A. Barkley.
Available from the National Technical Information Service, Springfield, Va., 22161 as PB-253 774 $4.50 in paper copy, $2.25 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 069, April 1976. 54 p., 11 fig., 5 tab., 6 ref. OWRT A-050-NMEX(1).

Descriptors: *Activated sludge, *Aerobic bacteria, Aerobic treatment, *Biological treatment, Sewage bacteria, *Sewage treatment, Sludge treatment, *Waste water treatment, *New Mexico, Industrial wastes, Chemical oxygen demand.
Identifiers: *Chili wastes, Shock loading.

The effect of chili waste on a completely mixed activated sludge waste water treatment process was determined. A bench scale model of a completely mixed activated sludge system was used. The system consisted of a primary clarifier, a completely mixed activated sludge unit, and a secondary clarifier. The activated sludge unit was rectangular with effluent flow over a single weir. Aeration and mixing were accomplished by compressed air injection. The system performance was evaluated with sewage and chili waste influents while attempting to hold all other operation parameters constant. The mode of system evaluation was efficiency of COD removal by secondary treatment. Chili waste is highly degradable by aerobic microorganisms and is at least as susceptible to treatment by activated sludge as sewage. A completely mixed activated sludge system suffers only a mild upset from shock loading with chili waste and has a quick recovery from the upset. (Hain - New Mexico State)
W76-08845

ENVIRONMENTAL EFFECTS OF COOLING SYSTEMS AT NUCLEAR POWER PLANTS,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-08848

TREATMENT AND DISPOSAL OF WASTE FLUIDS FROM ONSHORE DRILLING SITES,
Wilson Mud Service, Ltd., Edmonton (Alberta).
G. A. Specken.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 451-462, 3 tab.

Descriptors: *Waste storage, *Waste disposal, *Waste treatment, Drilling fluids, Cost analysis, Oil wells, Industrial wastes, Canada, Trout, Bioassay.
Identifiers: *Waste sumps, *Drilling fluid disposal, Sump fluid purification, Trout bioassay, Alberta(Canada).

The storage of oil well drilling fluid waste materials in open earthen pits (sumps) is of environmental concern. Volumes up to approximately 100,000 barrels of waste fluids may accumulate at drilling site. Disposal of these sump fluids is a problem where regulatory laws prohibit simple dumping of the fluids into the environment. Western Canada demands that clarified water from drilling site sumps must meet certain quality standards, primarily the passing of a trout bioassy before it can be disposed of. An in situ process has been developed where a major portion of the total fluid volume is generated as clarified, detoxified water. The remaining volume is left as a wet sludge in the bottom of the sump pit. This residue is usually buried. The overall cost of this process averages approximately 30 cents per barrel of sump fluid, although cost can range as high as 50 cents and as low as 20 cents per barrel. (See also W76-08889) (Heiss-NWWA)
W76-08910

THE TOXICITY OF DRILLING FLUIDS, THEIR TESTING AND DISPOSAL,
Alberta Energy Resources Conservation Board, Edmonton.
D. R. Shaw.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 463-471, 2 ref.

Descriptors: *Drilling fluids, *Toxicity, *Waste treatment, *Waste disposal, Wells.
Identifiers: *Drilling fluid additives, Drilling sumps, Synergistic effects, Fluid disposal standards, Subsurface disposal permits.

The complex additives of drilling fluids are often toxic. Single additives may be moderately toxic but in combination, the toxicity greatly increases. These toxic additives ultimately find their way to the sump, where their disposal becomes a problem. Sump fluid disposal standards have been developed by the Canadian Energy Resources Conservation Board. These standards outline procedures for the operator and government agencies to insure fluid disposal methods affect the environment as little as possible. (See also W76-08889) (Heiss-NWWA)
W76-08911

THE HANDLING AND TREATING OF WATER-BASED DRILLING MUDS,
Sun Oil Co., Richardson, Tex. Production Service Lab.
R. B. Allred.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 491-502, 6 fig, 7 ref.

Descriptors: *Drilling fluids, *Emulsions, *Drilling equipment, Waste treatment, Waste storage, Waste disposal, Wells, Separation techniques.
Identifiers: *Thixotropic colloidal suspension, Fluid circulation, Solids separation, Gas separation, Liquid separation.

Drilling fluids used in the drilling of most oil wells are usually forms of a thixotropic colloidal suspension with water. The purpose of these fluids is to remove cuttings from the borehole. A constant circulation is maintained down the hole and back into surface tanks where the fluid is reconditioned for further use. The reconditioning process consists of removing unwanted solids, liquids and gases. Discharged solid and liquids are either stored in holding tanks or reserve pits. Gases are disposed of at the well site. Drilling fluid contaminants and physical defects are chemically treated so as to recondition the fluid for re-use. Normally drilling fluids are not toxic to personnel. The use of high pH and toxic fluids are governed by special procedures to insure the safety of personnel and protection of the environment. (See also W76-08889) (Heiss-NWWA)
W76-08912

WASTE WATER BASE DRILLING FLUID DISPOSAL,
Dresser Industries, Inc., Houston, Tex. Oilfield Products Div.
L. R. Louden, and R. E. McGlothlin.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 515 - 522, 4 tab, 2 ref.

Descriptors: *Waste treatment, *Waste disposal, *Drilling fluids.
Identifiers: *Water-based drilling fluids, Environmentally safe disposal process.

Mud solidification is a new disposal process developed for disposal of water-based drilling fluids and cuttings that result in non-toxic environmentally safe material. The process is based on a reaction between soluble silicates and silicate setting agents, which are introduced at controlled rates to solidify the drilling fluid and cuttings. The pseudo-clay material resulting from crystaline growth, encapsulation and dehydration can be used for a variety of applications, including reclamation landfill and for treating a large variety of industrial wastes. Studies by an independent agronomist indicate that seed germination was not affected in garden soil which contained up to 40 percent solidified mud and germination was retarded only a few days in soils containing up to 80 percent. The process costs approximately 3 dollars per barrel and portable systems capable of processing 1,000 barrels a day are available. (See also W76-08889) (Heiss-NWWA)
W76-08914

DISPOSAL OF DRILLING FLUIDS AND DRILLED-UP SOLIDS IN OFFSHORE DRILLING OPERATIONS,
Texas A and M Univ., College Station. Dept. of Petroleum Engineering.
W. J. McGuire.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 523-530, 1 fig, 4 ref.

Descriptors: *Waste disposal, Drilling fluids, Water pollution sources, Regulation.
Identifiers: Water-based drilling fluids, Oil-based drilling fluids, Waste disposal regulations.

Offshore oil drilling operations usually utilize water-based drilling fluids. Oil-based fluids are only used where special drilling problems are encountered. The Outer Continental Shelf (OCS) Order No. 1, issued on August 28, 1969, directs that drilling fluids containing oil be disposed of on land. Most oil coated solids are also disposed of in this manner. Recently, some attempts to clean well cuttings for offshore disposal have succeeded. Disposal of drilled solids is usually stipulated in offshore lease agreement. These leases dictate that the drilled solids be discharged at a distance no greater than a designated distance from bottom (usually 20 feet). These stipulations are imposed in estauries and near reefs. (See also W76-08889) (Heiss-NWWA)
W76-08915

DIMENSIONING OF UNDERGROUND SEWER PIPELINES MADE OF PLASTIC TUBES (RASCHET PODZEMNYKH KANALIZATSIONNYKH TRUBOPROVODOV IZ POLIMERNYKH TRUB),
For primary bibliographic entry see Field 8B.
W76-08962

GIANT MOLE TO DIG SANITARY DISTRICT TUNNELS,
Midwest Engineer, Vol. 28, No. 6, p 4-7, March, 1976.

Descriptors: *Tunnels, *Sewers, *Waste water treatment, *Flow, Lake Michigan, Water pollution control, Excavation, Costs, Illinois.
Identifiers: Combined sewers, Chicago(Ill), Pilot studies.

An extensive project, the Tunnel and Reservoir Plan of the Metropolitan Sanitary District of Greater Chicago (MSDGC), has been designed to control the flow of sewage during wet weather periods from a metropolitan area of the city served by combined sewers. During storms, these sewers receive 10 times the dry weather flow or more. While common practice was to allow the peak flows to be diverted to rivers, in Chicago the water quality of the Chicago River, the Des Plaines River and the Calumet River Systems are seriously impaired by this practice. In order to control water pollution to these areas and to improve the quality of Lake Michigan waters, the MSDGC plans to construct over 125 miles of large diameter tunnels in rock beneath the waterways of metropolitan Chicago, at depths between 150 and 300 feet. During wet weather, combined sewer flow will be diverted to the tunnels and stored in holding reservoirs under aeration. Between storms, during dry weather, the captured flow will be pumped to treatment facilities, with increased pumping during periods when flow is normally low. Tunnel diameters will be between 15 and 35 feet. A large boring machine or 'mole' has been used at three pilot excavation projects and will be applied to the new plan in order to quickly and economically prepare the tunnels. (Kramer-FIRL)
W76-08963

FIBERGLASS FIGHTS SO3 ATTACK ON SEWERS,
For primary bibliographic entry see Field 8G.
W76-08964

PENNSYLVANIA SEWER PLACED IN CROWDED DITCH,
For primary bibliographic entry see Field 8F.
W76-08965

STORM SEWER PIPE JOINTS TIGHT AFTER TEN YEARS,
Domingue, Szabo and Associates, Inc., Lafayette, La.
For primary bibliographic entry see Field 8G.
W76-08966

WATER CONTROL SOLVES TOUGH SEWER PROBLEM,
For primary bibliographic entry see Field 8B.
W76-08967

PROBLEM: LOW HEADROOM, SOLUTION: PIPE ARCH,
For primary bibliographic entry see Field 8G.
W76-08968

BELLEVILLE PLANT USES 15 PUMPS IN FOUR STATIONS,
For primary bibliographic entry see Field 8C.
W76-08969

PIPELAYING 'HORSE' PREASSEMBLES AND HELPS INSTALL OCEAN OUTFALL,
For primary bibliographic entry see Field 8F.
W76-08970

BIOLOGICAL PURIFICATION OF WASTE WATERS,
Australian Patent 468,494. Issued January 15, 1976. Official Journal of Patents, Trade Marks and Designs, Vol. 45, No. 49, p 5442, January, 1976.

Descriptors: *Waste water treatment, *Activated sludge, *Patents, *Aeration, Equipment, Sludge treatment, *Biological treatment, Tanks.
Identifiers: *Clarification.

A patent has been granted for equipment to treat waste water using activated sludge. At least two clarifier tanks are in communication with an aeration tank by means of openings in a wall or partition. Provision is made for recycling sediment from the clarification tanks to the aeration tanks. Air lift type pumps discharge into the aeration tank from each of the clarifiers. These clarifiers are fed with a pulsating intermittent flow of air, which subsequently causes a pulsating recirculation of the settled sludge into the aerator. (Kramer-FIRL)
W76-08971

WASTE WATER PURIFICATION,
P. V. Knopp, and W. B. Gitchel.
Canadian Patent 981,815. Issued January 13, 1976. Patent Office Record, Vol. 104, No. 2, p 93, January, 1976.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Nitrification, Aerobic treatment, *Activated sludge, Activated carbon, Adsorption, *Denitrification, Anaerobic conditions.

A patent has been issued for a process to treat sewage. A combination of activated sludge for nitrification with an adsorbent such as powdered activated carbon is employed. This is followed by a denitrification step in the presence of additional adsorbent under anaerobic conditions. (Kramer-FIRL)
W76-08972

MOBILE SEWER CLEANING MACHINE,
For primary bibliographic entry see Field 8C.
W76-08973

PHOSPHORUS REMOVAL FROM WASTE WATER,
M. J. Bykowski.
Canadian Patent 983,632. Issued February 10, 1976. Patent Office Record, Vol. 104, No. 6, p 97, February, 1976.

Descriptors: *Chemical precipitatic-., *Iron, *Nutrient removal, *Phosphorus, *Patents, *Waste water treatment, Aerobic conditions, Anaerobic treatment, Separation techniques.

A patent has been granted for a process to reduce the phosphorus content of waste water. Part of the separated solids are recycled through part of the primary treatment process in order to first contact the waste water with products of an aqueous reaction with elemental iron. The mixture is then treated under aerobic and anaerobic conditions and the suspended solids fraction which contains the major portion of the influent phosphorus in a solid stable form is concentrated. A relatively clear liquid fraction may thus be separated from the effluent. (Kramer-FIRL)
W76-08975

METHOD AND APPARATUS FOR CHEMICALLY PURIFYING SEWAGE,
K. Tofaute.
Canadian Patent 984,528. Issued February 24, 1976. Patent Office Record, Vol. 104, No. 8, p 95, February, 1976.

Descriptors: *Patents, *Chemical precipitation, *Waste water treatment, *Sewage treatment, Mixing, Nutrient removal, Flocculation, Sedimentation.
Identifiers: Chemical treatment.

A chemical precipitation method for purifying sewage has been patented. This method is especially useful for the removal of phosphorus. The sewage to be treated and the precipitating agent are mixed in a zone located in the upper region of a basin. After complete mixing, the liquid is passed downward through a flocculation zone into a sedimentation zone. Water freed from the flocculant sludge is conveyed upward into a clear water zone, which is separated from the mixing and flocculation zones by a partition wall. (Kramer-FIRL)
W76-08976

WASTE WATER TREATMENT PLANT,
A. Adjouri, and R. Cyr.
Canadian Patent 984,526. Issued February 24, 1976. Patent Office Record, Vol. 104, No. 8, p 95, February, 1976.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Treatment facilities, *Sludge treatment, Aeration, Sedimentation, Equipment, Flow characteristics, Mixing.
Identifiers: Complete mix principle.

A waste water treatment facility which uses the complete mix principle to produce biological sludge and clarified water has been patented. The plant consists of an aeration chamber, a settling chamber and a partition between the two chambers. The partition include several panel units, each with a baffle, an opening for the transfer of mixed liquor from the aeration chamber to the settling chamber, and a pair of recirculation ducts, secured against their baffle to form a framework. These ducts may be actuated by a controlled air flow and are situated so as to minimize the difficulties in plant flow characteristics. (Kramer-FIRL)
W76-08977

WASTE TREATMENT PROCESS,
J. S. Jeris, C. Beer, and J. A. Mueller.
Canadian Patent 986,239. Issued March 23, 1976. Patent Office Record, Vol. 104, No. 12, p 87, March, 1976.

Descriptors: *Waste water treatment, *Denitrification, *Patents, Carbon, Biological treatment, Bacteria.
Identifiers: Fluidized beds.

A patent has been issued for a waste water treatment process involving denitrification. A fluidized bed containing denitrifying biota is generated on a particulate carrier. A carbon source is then metered into the waste water. Excess bacterial growth is mechanically removed from the carrier at predetermined intervals. (Kramer-FIRL)
W76-08978

WASTE-WATER PURIFICATION,
Australian Patent 467,690. Issued December 11, 1975. Official Journal of Patents, Trade Marks and Designs, Vol. 45, No. 46, p 5063, December, 1975.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, *Organic compounds, Oxidation, Nitrogen removal, Anaerobic treatment, Aerobic treatment, Sludge treatment, Separation techniques, Ammonia.

A newly patented process for treating waste waters by simultaneously removing organic carbonaceous material and biologically oxidizing the

reduced nitrogenous forms is described. This procedure is followed by reduction of the oxidized nitrogen to elemental nitrogen. An aqueous suspension of adsorbent is introduced to the effluent while a non-condensible oxygen-containing gas is added to a vessel containing waste water, developing an active biomass with a sludge age of at least three days. Aerobic conditions are maintained for a period to oxidize ammoniacal nitrogen to nitrate or nitrate nitrogen. The adsorbent is settled and separated and associated adsorbed organic material and biological slids are returned to the vessel. The liquid phase is then passed to an anaerobic zone where further adsorbent and a source of organic carbon are added, reducing the oxidized forms to elemental nitrogen. Finally, the mixture is passed to a quiescent zone where the adsorbent and associated organic material may be removed from the waste water. (Kramer-FIRL)
W76-08979

ACTIVATED SLUDGE PLANT,
R. H. Uden.
Canadian Patent 982,283. Issued January 20, 1976. Patent Office Record, Vol. 104, No. 3, p 95, January, 1976.

Descriptors: *Patents, *Activated sludge, *Treatment facilities, *Sewage treatment, Waste water treatment, Aerobic digestion, Tanks, Equipment.

A patent has been issued for an activated sludge treatment facility which is adapted to handle sewage loading. Raw sewage influent passes through the activated sludge process and is discharged as purified water. The plant has been designed for aerobic decomposition of raw sewage. In series, the influent is treated in a digester tank, several aeration tanks, a settling tank, and a final aeration tank. (Kramer-FIRL)
W76-08980

AEROBIC SEWAGE TREATMENT SYSTEM,
K. J. Yost.
Canadian Patent 980,923. Issued December 30, 1975. Patent Office Record, Vol. 103, No. 52, p 93, December, 1975.

Descriptors: Domestic wastes, *Patents, *Sewage treatment, *Aerobic digestion, Sedimentation, Tanks, Equipment, Flow, Chlorine, *Waste water treatment, Settling basins.

Liquid sewage from an individual residence is treated in a large, flat and shallow aerobic settlement tank by a patented method. This exposes a large surface area of the sewage per unit volume. Air is circulated over the surface in a spiral direction, thus effecting circulation or turbulence of the sewage within the tank and diffusion of air into the liquid. The liquid is then directed into an aerobic digestor and clarifier tank, which similarly circulates the treated liquid and diffuses the air in response to a spiral air flow created by a chimney draft. The second tank, therefore, is an annular clarifier chamber which receives the treated liquid before it is discharged. Discharged effluent is directed through a chlorinator and chlorine crystals are pushed downward into the path of effluent by a combined weight and valve. This will stop the flow of treated liquid whenever additional chlorine crystals have not been added to the supply. (Kramer-FIRL)
W76-08982

UP-FLOW SEPARATOR,
T. R. Westfall.
Canadian Patent 982,492. Issued January 27, 1976. Patent Office Record, Vol. 104, No. 4, p 44, January, 1976.

Descriptors: *Patents, *Sewer systems, *Combined sewers, *Waste water treatment, *Separation techniques, Screens, Flow rates, Cleaning, Waste disposal.
Identifiers: *Up-flow separators.

Equipment and methodology for screening and concentrating waste water overflow from combined sewer systems have been patented. Such equipment includes a separator employing a substantially cylindrical rotating screen. Influent is piped upwardly into the system and deflected out toward the inner surface of the screen, thus achieving the desired flow rate and flow pattern of the influent onto the screen. Flow rate is controlled with several substantially discrete inclined streams. The screen is rotated at the correct speed to achieve the desired centrifugal force. A description of the handling of the influent, effluent, concentrate, and backsplash is provided, and the manner in which the influent is screened to achieve a fluid concentrate pumpable to other treatment equipment for ultimate disposal is also detailed. (Kramer-FIRL)
W76-08983

PROCESS FOR TREATING SEWAGE SLUDGE AND FERTILIZER PRODUCTS THEREOF,
Orgonics, Inc., Slatersville, R.I. (Assignee).
J. M. O'Donnell.
United States Patent 3,942,970. Issued March 9, 1976. Official Gazette of the United States Patent Office, Vol. 944, No. 2, p 809, March, 1976. 1 fig.

Descriptors: *Sludge treatment, *Dewatering, *Patents, *Waste water treatment, Sewage sludge, Fertilizer, Filtration, Odor.
Identifiers: *Sludge filter cake.

Sludge filter cake may be treated with a newly patented process. The sludge filter cake is reduced to a particle size of about 1/8th inch or less and the moisture content of the reduced sludge is decreased to between 30 and 50%, providing a partially dried sludge. In a reactor, an acid is added to the partially dried sludge, giving a pH of between 3 and 5. An alkaline N-methylol-urea aqueous prepolymer solution is prepared by the reaction of from about 1.1 to about 2.0 moles of urea per mole of formaldehyde. The prepolymer solution is immediately reacted with the partially dried sludge in a second section of the reactor, while continuously moving the sludge from the inlet to the outlet of the reactor at a temperature of from 30 to 80 C and a pH of 3 to 5. The sludge particles in the first and second sections of the reactor are vigorously mixed for a sufficient time to complete the reaction and conversion of the prepolymer. The reaction product is dried at a temperature of less than 95 C to a moisture content of about 3 to 10%, thus producing a granular, high-nitrogen, odorless fertilizer product. (Kramer-FIRL)
W76-08984

APPARATUS FOR TREATMENT OF WATER, PARTICULARLY WASTE WATER,
E. J. Bosshard.
Canadian Patent 982,780. Issued February 3, 1976. Patent Office Record, Vol. 104, No. 5, p 7, February, 1976.

Descriptors: *Patents, *Waste water treatment, *Microorganisms, *Irradiation, *Gamma rays, Liquids, Disinfection.

An invention for treating microorganism-containing waste water is described. The liquid is forced to circulate in a closed loop, flowing at least twice past one radiation source. Sufficient gamma radiation to destroy at least some of the microorganisms is employed. (Kramer-FIRL)
W76-08985

CENTRIFUGE PREVENTING AIR ADMISSION DURING SLUDGE DISCHARGE,
De Laval Separator Co., Poughkeepsie, N. Y. (Assignee).
K. Nelson.
United States Patent 3,390,609. Issued January 6, 1976. Official Gazette of the United States Patent Office, Vol. 942, No. 1, p 305, January, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sludge treatment, *Centrifugation, Equipment, *Patents, Separation techniques.

A centrifuge design for sludge treatment has been patented. The special feature of this equipment is that air admission during sludge discharge is prevented. The sludge centrifuge comprises a centrifugal bowl rotating about an axis which forms a separating chamber with an inlet for a mixture of liquid and solids. The bowl also forms a paring chamber, connected to the separating chamber, where the liquid separated as a relatively light component from the liquid/solids mixture is collected. The separating chamber has an outer sludge space for receiving solids separated from the mixture as a relatively heavy sludge component. Means are provided to alternately open and close the outer edges of the bowl to discharge sludge intermittently from the sludge space. A stationary paring disk in the paring chamber discharges separated liquid from the bowl while its outer periphery is closed to maintain a normal liquid level in the bowl. This liquid level moves radially outward from the bowl axis in response to opening of the bowl's outer periphery. An air passage at the radially inner portion of the paring chamber provides a means for discharging air from the bowl to the atmosphere while the liquid is at the normal level. A dam rotating with the bowl limits the outward movement of the liquid level in the paring chamber, thus maintaining a minimum liquid level in the paring chamber during sludge discharge. Means in the paring chamber which are operable at the minimum liquid level prevent air from being pulled into the bowl through the air passage during sludge discharge. (Orr-FIRL)
W76-08990

SEWAGE TREATMENT SYSTEM,
G. E. Wilson.
Canadian Patent 980,924. Issued December 30, 1975. Patent Office Record, Vol. 103, No. 52, p 93, December, 1975.

Descriptors: *Patents, *Sewage treatment, *Flocculation, *Polymers, *Waste water treatment, Aeration, Microorganisms.

A sewage treatment process using a high polymer ratio flocculation agent, biologically produced on site to flocculate the colloidal suspended solids upstream of the primary clarifier, has been patented. The flocculation agent is produced by subjecting microorganisms which are capable of generating polymeric material to a high food content in an aeration tank. Supernatant from the primary clarifier is passed into this tank. The microorganisms are then subjected to a low food content environment, thus generating polymeric material through the extracellular activity of the microorganisms. (Kramer-FIRL)
W76-08992

METHOD AND APPARATUS FOR TREATING A CONTINUOUS FLOW OF FLUID WASTE PRODUCTS AND OTHER MATERIALS,
Adrian Construction Co., Dayton, Ohio. (Assignee).
F. T. Varani.
United States Patent 3,946,679. Issued March 30, 1976. Official Gazette of the United States Patent Office, Vol. 944, No. 5, p 2233, March, 1976.

Descriptors: *Patents, *Waste treatment, *Organic compounds, *Waste disposal, Burning, Equipment, *Incineration, *Drying.

A patent has been granted for a method to dry or burn a continuous flow of organic waste material. The material is pumped through an elongated rigid porous tube, forcing a gas radially inward through

the pores of the tube, and into the material flowing through the tube. This creates a turbulence which disintegrates the material into fine particles and accelerates the flow of particles within the tube. The accelerated particles are then discharged from the tube and into a heating chamber where they expand. A flame is directed into the material, with air introduced into the disintegrated material after it is discharged, before being contacted with the flame. (Kramer-FIRL)
W76-08993

PHOSPHORUS REMOVAL FROM WASTEWATER,
G. L. Shell, and D. E. Burns.
Canadian Patent 985,805. Issued March 16, 1975. Patent Office Record, Vol. 104, No. 11, p 78, March, 1976.

Descriptors: *Patents, *Phosphorus, *Nutrient removal, *Waste water treatment, Liquid wastes, Cations, Sludge treatment, Effluents.

A patent has been issued for a method to reduce the soluble phosphorus content of a phosphorus-containing liquid waste. A multi-zoned countercurrent reaction system is employed, including a final reaction zone and at least one preceding reaction zone. A metallic cation is added to the liquid waste as it enters the final reaction zone. An adsorptive sludge and an effluent containing a low residual phosphorus content are thereby produced. Effluent is discharged for further treatment or use and the sludge is removed from the final reaction zone and introduced into the preceding reaction zone containing the phosphorus-bearing liquid. Effluent from this zone is combined with a chemical and continuously fed into the final reaction zone. Thus, a chemical equilibrium may be maintained between the phosphorus present in the solid phase of adsorptive sludge and the residual soluble phosphorus present in the liquid phase of the effluent. (Kramer-FIRL)
W76-08994

BIOLOGICAL TREATMENT OF STERILISED AQUEOUS WASTE.
Australian Patent 469,399. Issued February 12, 1976. Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 4, p 369, February, 1976.

Descriptors: *Patents, *Waste water treatment, *Separation techniques, Microorganisms, Oxygen, Sludge treatment, Recycling, *Biological treatment.

A method has been patented for treating water with organic contaminants. The sterile liquid produced by an initial sterilization step is mixed with sludge activated by a selected microorganism. Between one and 50% of the mixture's weight is sludge. This mixture is then contacted with an oxygen containing gas. The sludge and the liquor are separated; at least a portion of the sludge is recycled. (Snyder-FIRL)
W76-08995

SEWAGE PIPE FITTING,
For primary bibliographic entry see Field 8G.
W76-08996

REMOVAL OF WATER FROM SLUDGES WITH FILTER PRESSES (SCHLAMMENTWAESSERUNG MIT PRESSFILTERN),
C. Alt.
Chemie-Ingenieur-Technik Vol. 48, No. 2, p 115-124, February, 1976. 17 fig, 1 tab, 7 ref.

Descriptors: *Sludge treatment, *Dewatering, Equipment, Filtration, *Waste water treatment.
Identifiers: *Filter presses.

Filter presses have been used to decrease the residual moisture in certain sludge filter cakes. Several types of machinery, both batch and continuous, have proven efficient for this purpose. Others continue to be tested. A brief theoretical description, which permits some conclusions to be drawn regarding the process engineering problems involved, is provided. Some of the most important developments in sludge dewatering are also described. (Kramer-FIRL)
W76-08998

AN EXPERIMENTAL INVESTIGATION OF TERTIARY TREATMENT WITH A SUBMERGED FILTER (SESSHOKU BAKKIHO NI YORU GESUI SANJISHORI NO JIKKENTEKI KENKYU),
S. Masuda, M. Ishiguro, and Y. Watanabe.
Miyazaki Daigaku Kogaku-bu Kenkyu Hokoku, No. 21, p 19-25, 1975. 7 fig, 3 tab, 12 ref.

Descriptors: *Filters, *Tertiary treatment, *Waste water treatment, *Sewage treatment, Nitrification, Denitrification, Nutrient removal, Notrogen compounds, *Filtration.
Identifiers: Submerged filter.

An investigation has been made of tertiary treatment for secondary treated sewage effluents. Some of the results obtained from a laboratory scale submerged filter unit operated on pretreated domestic sewage with activated sludge are described. The submerged filter consists of a bed of media through which the waste water passes with air in an upward direction. Nitrification of bacteria takes place on the surface of stones and charcoal, and long solids retention times are possible. This method provides a highly efficient means of removing BOD, PO4, and NH4-N from secondary treated domestic sewage. The influent BOD and NH4-N concentrations range from 18 to 34 and from 28 to 43 ppm, with the PO4 concentration averaging approximately 10 ppm. At a BOD loading of 0.56 kg/cu m/day of media, the unit achieved 75% removal of BOD to yield an effluent with 8 ppm BOD. At 0.05 kg/cu m/day NH4-N loading, 97% removal of NH4-N was obtained to yield an effluent with 1.7 ppm NH4-N. A subsequent denitrification experiment was performed in which only 0.5 hours contact time were needed to yield an effluent of zero ppm N03-N at a 4400 ppm MLSS level. (Kramer-FIRL)
W76-08999

ELECTRIC EQUIPMENT FOR MUKOGAWA SEWAGE TREATMENT PLANT, HYOGO PREFECTURE (HYOGOKEN MUKOGAWA SHORIJO NO DENKI SETSUBI),
Hanshin City Improvement Bureau (Japan).
K. Yokomichi, H. Hatada, S. Takahashi, M. Machida, and Y. Shiraki.
Toshiba Rebyu, (Toshiba Review) Vol. 31, No. 1, p 37-43, January, 1976. 10 fig, 3 tab.

Descriptors: *Sewage treatment, Computers, *Waste water treatment, *Automation, *Treatment facilities, Instrumentation, Water quality.
Identifiers: Japan.

The Muskogawa Sewage Treatment Plant in Hyogo Prefecture, Japan, has been built to cope with deteriorating water quality due to sewage from homes and waste water from factories. Goals include improved treatment efficiency to preserve water quality, and automation of operation to effect manpower savings. Control has been centralized by instrumentation and processes have been automated by introducing control computers. The facilities have been designed to produce further qualitative improvement in treatment through computer control, adapting to the individual quality and quantity of water. (Kramer-FIRL)
W76-09000

RECLAMATION AND USE OF MUNICIPAL WASTE WATER (TOSHI NI OKERU SEIKATSU HAISUI NO SAI-RIYO),
A. Ikehata.
Kagaku to Kogyo, Vol. 28, No. 11, p 807-811, November, 1976. 1 fig, 2 tab, 1 ref.

Descriptors: *Water reuse, *Municipal wastes, *Waste water treatment, Industrial water, Biological treatment, Coagulation, Adsorption, Reverse osmosis, Ion exchange, Electrodialysis, Chlorination, Ozone.
Identifiers: Ammonia stripping.

The reuse of municipal waste water in Japan is discussed. Although actual water purification techniques can regenerate water within the quality of drinking water specified by law, the present use of regenerated waste water for potable purposes is not likely. The use of regenerated water for non-potable purposes has also met with citizen objections because of an emotional response to using 'dirty' waste water. Therefore, water reuse has been limited to industrial water. Techniques for the regeneration of municipal waste water include biological treatment, coagulation, adsorption, oxidation, and reverse osmosis for treating total organic compounds; biological treatment, ion exchange, ammonia stripping, and reverse osmosis for treating nitrogen and phosphorus compounds; coagulation, ion exchange, reverse osmosis, and electrodialysis for treating metals and inorganic compounds; and chlorine and ozone methods for disinfecting harmful microorganisms and viruses. These methods are being used to treat secondary treated sewage water for reuse. (Katayama-FIRL)
W76-09001

SPECIFIC POLLUTANTS IN URBAN WASTE WATERS AND THE EFFICIENCY OF THEIR PURIFICATION (SPETSIFICHESKIE ZAGRYAZNENIYA GORODSKIKH STOCHNYKH VOD I EFFEKTIVNOST' IKH OCHISTKI),
For primary bibliographic entry see Field 5A.
W76-09002

LAMELLA SETTLING TANKS (LAMELLA-ABSETZBECKEN),
For primary bibliographic entry see Field 5F.
W76-09003

SLUDGE STERILIZATION BY GAMMA RAYS (LA STERILIZZAZIONE DEI FANGHI CON RAGGI GAMMA),
Inquinamento, Vol. 17, No. 11, p 51-52, November, 1975.

Descriptors: *Sludge treatment, *Gamma rays, *Irradiation, Pathogenic bacteria, Disinfection, *Waste treatment.

In order to eliminate pathogens from sludges, a new treatment process has been developed based on ionizing irradiation of the bacteria and parasites. The facility consists of an irradiation pit with a central tube where the sludge is moved around during treatment, a processing system with circulation, and an aspiration pump, regulatory mechanisms, and pipes. Operations are discontinuous and full automatic. Irradiation improves the dewaterability of the sludge; with sedimentation alone, it is possible to remove at least half the water content of the sludge. The process does not consume oxygen and does not release gas or organic nitrogen compounds. The simple structure and functioning of the installation require only 30 minutes of human control per day. (Waltner-FIRL)
W76-09004

WASTE WATER PURIFICATION PLANT UH-WIESEN-DACHSEN

(ABWASSERREINGUNGSANLAGE UHWIESEN-DACHSEN),
Schweizerische Bauzeitung, Vol. 93, No. 45, p 719-722, November, 1975. 6 fig.

Descriptors: *Waste water treatment, *Biological treatment, *Treatment facilities, Aeration, Settling basins, Anaerobic digestion, Sludge treatment.
Identifiers: Aerobic digestion, Switzerland.

The new biological waste water treatment plant Uhwiesen-Dachsen (Switzerland) is described. After the separation of floating objects, sand and fats are separated in an aerated basin. The treatment facility is composed of an aeration basin and of a sludge settling basin, and a third stage is provided for the coprecipitation of phosphates by means of metal salts. Sludge is fermented, first anaerobically at 33 C, and then in an aerobic fermenter. The gas released in this process is used for heating various units of the waste water treatment plant. (Takacs-FIRL)
W76-09005

MEASUREMENT OF THE OXYGENATION CAPACITY IN WASTE WATER TREATMENT PLANTS USING COMPLETELY MIXED ACTIVATED SLUDGE (MESURE DE LA CAPACITE D'OXYGENATION DANS LES STATIONS DE TRAITEMENT A BOUES ACTIVEES EN MELANGE INTEGRAL),
P. Boutin, A. Vachon, J. P. Bechac, and B. Lopez.
Techniques et Sciences Municipales--L'Eau, No. 1, p 493-501, November, 1975. 6 fig, 5 tab, 16 ref.

Descriptors: *Activated sludge, *Dissolved oxygen, Oxygenation, Aeration, Respiration, *Waste water treatment, Measurement, Pollutant identification.

In order to determine the oxygenation capacity of activated sludge treatment plants, the aeration and recycling processes were interrupted to allow the dissolved oxygen content to drop to 0 mg/liter through respiration of the microorganisms. Aeration was periodically resumed for short periods of time to maintain the homogeneity of the sludge and to avoid decantation. When the oxymeters indicated values close to 0 mg/liter, the procedure was begun. A volume of sludge was removed equal to the capacity of the pilot aeration installation and was deposited in it. Biological phenomena were blocked, in particular respiration, by adding a bacterial toxin such as a solution of copper sulfamate. Oxygen concentration was noted in terms of time. The oxymeter indicated a stationary value when the saturation concentration had been reached. The oxygen was then chemically determined according to the Winkler method. Aeration in the activated sludge vat was determined at the same time. Interpretation consisted of measuring at various points the slope of the curve on the basis of p equals K(Cs-C) to the R power where p is slope, R is respiration, K is aeration coefficient, Cs is saturation concentration, and C is concentration of the liquid. Since nominal conditions are usually not identical to experimental conditions, it was necessary to utilize corrective factors in terms of waste water and pure water, the initial temperature at the beginning of the process and the standard 10 C, and the experimental and normal atmospheric pressures. (Waltner-FIRL)
W76-09006

DISINFECTION OF URBAN SEWAGE SLUDGE (LA DESINFECTION DES BOUS RESIDUAIRES URBAINES),
D. Alexandre, P. Gevaudan, J. Charrel, M. N. Mallet, and A. Blancard.
Techniques et Sciences Municipales--L'Eau, No. 12, p 547-555, December, 1975. 6 fig, 7 tab, 16 ref.

Descriptors: *Sludge treatment, *Disinfection, Gamma rays, *Irradiation, *Lime, Pathogenic bacteria, Sewage sludge.
Identifiers: *Tyndallization.

A total of 134 sludge samples were taken from total oxidation treatment, aerobic treatment, and anaerobic treatment in order to compare the efficiencies of three disinfection processes: liming, tyndallization, and irradiation. Observations focused on typical fecal bacteria and experimentally added pathogenic agents such as mycobacteria and ascaris eggs at various stages of growth. Results indicate that with tyndallization, 47.7% coli bacilli and 53% streptococci resisted, 83% mycobacteria survived, and clostricium spores increased in number by a factor of 10. With liming, 0.34% coli bacilli, 0.63% streptococci, and 0.49% clostridium spores remained; the process did not affect ascaris eggs and mycobacteria. Gamma ray irradiation results varied according to the radiation dose. With 400 R, 2.22% coli bacilli, 2.36% streptococci, 33.8% clostridium spores, and 94% mycobacteria remained; with 800 R, 0.04-0.35% enterobacteria, 3% clostridium, and 0.4% mycobacteria survived. With 1,200 R, residual percentages were, respectively 0.0023, 0.007, 0.2, and 0%, and with 1,800 R, 0.0006, 0.0013, 0.002, and 0%. Irradiation could only destroy smooth-shelled embryonic ascaris eggs starting at 400 R. The source of the sludges did not seem to influence the efficacy of treatment. While liming was effective for sludges which did not contain hospital effluents, it cannot handle atypical mycobacteria which are epidemiologically significant. (Waltner-FIRL)
W76-09007

APPLICATION OF CENTRIFUGES. DEWATERING OF SLUDGES FROM WATERWORKS (APPLICAZIONE DI CENTRIFUGHE. DISIDRATAZIONE DI FANGHI PROVENIENTI DA IMPIANTI DI POTABILIZZAZIONE),
For primary bibliographic entry see Field 5F.
W76-09008

CURRENT AERATION TECHNIQUES--AN OVERVIEW,
Water and Pollution Control, Vol. 114, No. 2, p 16-19, February, 1976. 1 tab.

Descriptors: *Aeration, *Oxygen, Equipment, Kinetics, Evaluation, Performance, *Waste water treatment, Water treatment, *Reviews.

An overview is presented of current aeration techniques for water and waste water treatment. The more common types of aeration equipment include: diffused aeration systems, submerged turbine aerators, and high- and low-speed surface aerators. Oxygen transfer occurs by generating the largest practical area of interface between a given liquid volume and air, preventing the build-up of thick interfacial films, and maintaining the highest possible driving force or concentration difference for adsorption and desorption. Most mass transfer applications in waste treatment are liquid-film controlled. An equation is provided to describe the oxygen transfer process, which involves the oxygen transfer coefficient, the oxygen saturation coefficient, the air-water interface and the volume of aerated liquid. Several procedures for testing aerators to determine equipment capabilities are available. The most widely accepted performance evaluation is the non-steady-state reaeration test. Any tests which compare different aeration devices must account for variations in physical and in chemical conditions. Various types of mechanical aerators, air diffusers, submerged turbines, and surface aerators are also described. (Kramer-FIRL)
W76-09009

WASTEWATER RECYCLING UTILIZES PESKY NUTRIENTS,
Public Works, Vol. 107, No. 3, p 60-61, March, 1976.

Descriptors: *Waste water treatment, *Recycling, *Biological treatment, Sewage treatment, Treatment facilities, Equipment, Irrigation, Nutrients, Phosphorus, Nitrogen, Algae, Agriculture, Water reuse, Cycling nutrients, Cladophora.
Identifiers: Land application.

A waste water treatment system being utilized at the Institute of Water Research at Michigan State University is described. The Water Quality Management Project (WQMP) facility includes a portion of the East Lansing sewage treatment plant, and will have the capacity of 2 mgd of waste water. The WQMP pumps waste water which contains large amounts of phosphorus and nitrogen to an area where it flows through each of four lakes. Solar energy powers photosynthesis in the lakes. Algae and rooted aquatic plants take up abundant supplies of the nutrients. The plants are harvested using a modified commercial aquatic weed cutter and special equipment similar to a rake. The typical algae harvested is Cladophora, used mainly for composting, and also for research on the possibility of feeding it to sheep. Dead algae, plankton, and other chemical compounds which settle to the bottom of the lakes are pumped and irrigated onto land. Bass have been stocked in the fourth lake and are reported to be thriving. Water from any of the four lakes may be applied to land by irrigation. Water not used for irrigation, but of a quality adhering to environmental standards, will be passed to the Red Cedar River. (Kramer-FIRL)
W76-09010

POLLUTION CONTROL PLANT IS DESIGNED TO BE AN ATTRACTIVE NEIGHBOR, TOO.
Engineering News-Record, Vol. 196, No. 13, p 25, March 25, 1976. 2 fig.

Descriptors: *Treatment facilities, *Sewage treatment, *Waste water treatment, Texas, Activated sludge, *Design, Filtration, Flow rates, Activated carbon.

A new municipal waste water treatment facility is being built in Austin, Texas, quite near a residential area. To overcome resistance to expansion at the site, plans for the new facility include landscaping the plant site, with the creation of buffer zones between the plant and its neighbors. About half of the 300-acre site will be given to the parks and recreation department for the creation of a golf course when the facility is complete in 1977. The rest of the site will accomodate expansion up to 150 mgd. With a combination of activated sludge and rapid sand filtration, the new plant is expected to produce effluent with 10 ppm BOD and 10 ppm suspended solids. The design calls for covering the facility's flow equalization and primary treatment basins and enclosing its grit removal equipment, as well as using activated carbon filters to remove odors. (Kramer-FIRL)
W76-09011

SLUDGE HANDLING AND DISPOSAL: A SPECIAL REPORT,
Pollution Engineering, Vol. 8, No. 1, p 22-23, January, 1976. 11 fig, 12 tab.

Descriptors: *Sludge, *Sludge disposal, *Sludge treatment, *Dewatering, Treatment, Polymers, Filtration, Suspended solids, Vacuum drying, Incineration, Gravity, Centrifugation, Waste water treatment.
Identifiers: Sludge dewatering, Gravity belt filtration.

Methods of sludge dewatering and disposal are discussed. Initially, quantitative limits were applied to solids levels. Twenty to 24% was considered acceptable. Later, more qualitative limits were applied. Wastes take on the density and dewatering characteristics of their components. Treatment systems must be chosen for plants that do not yet exist. Two processes are available for the removal of water from sludges: concentration and dewatering. Advantages and disadvantages of various equipment are discussed. Organic

polymers have shown much advantage in improving the settling of noncharged particles and in sludge dewatering. Gravity separation can be very useful for removal of suspended solids, primarily because of the free cost of separation energy. The main disadvantage is the large area required. Vacuum filtration depends upon atmospheric pressure acting on a vacuum. Several types are discussed. Additional equipment or processes may be needed to condition the sludge before they are ready for vacuum filtration. Design parameters for this method are discussed. Gravity belt filtration has been used for municipal sludge and is being studied for use in industrial sludges. This method is used on sludges in which polymers have been added for particle flocculation. Three different types of centrifuges for dewatering sludge are discussed: the solid bowl-scroll type; the imperforate basket type; and the disc-nozzle type. Plate and frame filtration is a batch process particularly adapted to filtration of solid slurries. Incineration is used for disposal of organic sludges. Sludge can also be used as fertilizer as long as the metal content is low. (Pinto-FIRL)
W76-09012

PORTLAND ADDS SECONDARY TREATMENT,
Stevens, Thompson and Runyan, Inc., Portland, Oreg. Environmental Engineering Div.
J. A. Crom.
The American City and County, Vol. 91, No. 1, p 30-32, January, 1976.

Descriptors: *Sewage treatment, *Waste water treatment, *Treatment facilities, *Water quality, Oregon, Sludge, disposal, Water pollution control, Activated sludge, Centrifugation, Training, Education, Personnel, Dewatering.
Identifiers: Portland(Ore), Secondary clarifiers, Grit removal, Shock flows.

Portland, Oregon, has been listed by the Environmental Protection Agency as one of the best places to live in the country. In the latest step to protect the water quality, a 42 million dollar program for water pollution control was implemented. A new 25 million dollar treatment facility will increase the efficiency of the plant from 30% to 90%. However, in attempting to operate at maximum efficiency and produce a high quality effluent, problems were encountered. Skill and experience of plant operators are important in achieving successful performance, so operator training plays a significant role in planning. The operation of the plant is discussed. Grit separation occurs in two stages. Grit and sludge are removed and separated by centrifugal grit removers. The amount of grit that was removed was well above the amount that was expected, and manual cleaning was required. A pre-grit removal section is planned. The secondary system uses a complete mix activated sludge process. Secondary clarifiers are of the vacuum sludge removal type. Return flows containing high strength organics are conditioned and equalized to avoid subjecting the aeration system to shock flows. The disposal of residuals or excess sludge is a difficult problem, especially with Portland's rainy climate. Disc centrifuges thicken the activated sludge to about 4.5% solids. It is dewatered on vacuum filters and disposed of in landfill. Other options are discussed. Incineration requires much energy and produces air pollution. Transportation to Oregon's dry inland plateau during the rainy winter has more potential. Problems still must be resolved before such a step is taken. (Pinto-FIRL)
W76-09013

METHODS FOR FILTERING NITRIFIED EFFLUENTS,
Jones and Henry Engineers Ltd., Toledo, Ohio.
F. F. Sampayo.
Water and Sewage Works, Vol. 123, No. 2, p 71-73, February, 1976. 4 tab.

Descriptors: *Waste water treatment, *Design criteria, *Filters, *Nitrification, Ammonia, Data collection, Activated sludge, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Flow rates, Effluents, Ohio, Treatment facilities.

Two case histories are presented on the determination of design parameters for filtering nitrified effluents produced from activated sludge or plastic media trickling filters. Data collected at Lima, Ohio, and at Sylvania, Ohio, are provided. Studies at both locations were conducted to determine the feasibility of efflent filtration. The current process at Lima consists of primary treatment, with activated sludge and plastic media trickling filters used for nitrification. For various filter rates, the influent and effluents were measured for BOD, suspended solids, and turbidity, with the average removals of BOD and SS recorded. Ammonia concentration in the influent and effluent were also measured. At Sylvania, where the present treatment includes chemical precipitation of phosphorus in primary treatment followed by activated sludge, data were collected on flow rates, influent and effluent turbidity, BOD, suspended solids, and COD. A comparison was also made of the length of filter runs versus headloss. The results of both studies indicated that: filtration of nitrified activated sludge or nitrification tower effluents presented no special problems; average filter rates, about 4.0 gpm/sf may be used for design; and, the ammonia concentration in the effluent is dependent upon the performance of the biological treatment processes, and is not related to the effectiveness of the filter design. (Kramer-FIRL)
W76-09015

COSTS OF BIOLOGICAL WASTE WATER PURIFICATION (DIE KOSTEN DER BIOLOGISCHEN ABWASSERREINIGUNG),
J. Negaard.
Gas-Wasser-Abwasser, Vol. 56, No. 1, p 18-24, 6 fig, 2 tab, 1 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Treatment facilities, *Costs, *Sewage treatment, Capital costs, Operating costs, Statistical methods, Regression analysis.
Identifiers: *Switzerland.

Data from 50 Swiss sewage treatment plants were used to derive functional relationships between the construction and operating costs and their main parameters. For various costs, the combined effect of all important parameters may be determined by means of a multiple regression technique. This method has obtained much more reliable functions than those where only a single parameter is considered. By analysis of the cost relationships, some important conclusions concerning the construction and operating costs of sewage treatment plants can be drawn. (Kramer-FIRL)
W76-09016

TREATMENT OF WASTE WATER CONTAINING MERCURIALS BY ACTIVATED SLUDGE. I. MECHANISM OF REMOVAL OF MERCURIALS IN WASTE WATER (KASSEI ODEI NI YORU SUIGIN GANYU HAISUI NO SHORI NI KANSURU KENKYU. I KASSEI ODEI NO SUIGIN JOKYO KIKO),
K. Nakamura, J. Ito, and M. Dazai.
Kogyo Gijutsuin Biseibutsu Kogyo Gijutsu Kenkyusho Kenkyu Hokoku (Reports of the Fermentation Research Institute) No. 47, p. 49-57, December, 1975. 7 fig, 2 tab, 7 ref.

Descriptors: *Mercury, *Waste water treatment, *Activated sludge, Measurement, Heavy metals.
Identifiers: Volatilization, Index of activity.

The mechanism occurring in the treatment of waste water containing mercurials was studied. Discontinuous treatment of waste water containing mercuric chloride by activated sludge proved satisfactory; mercury removal rates were over 99.8% in all cases. Volatilization also removed mercury. Using sludge acclimated to low concentrations (below 15 ppm) of mercuric chloride, the mercury concentration in the solution decreased rapidly after the addition of mercuric chloride. Within several hours, volatilization of mercury was almost complete, but at that time 1 to 3% per dry sludge weight mercury remained in the sludge. This mercury was volatilized after further addition of mercuric chloride. In activated sludge treatment, it was assumed that the use of mercury volatilization rate as the index of activity was appropriate for waste waters containing mercurials. (See also W76-09018) (Kramer-FIRL)
W76-09017

TREATMENT OF WASTE WATER CONTAINING MERCURIALS BY ACTIVATED SLUDGE. 2. MERCURY VOLATILIZATION AND THE CAPACITY OF ACTIVATED SLUDGE FOR WASTE WATER CONTAINING MERCURIALS (KASSEIODEI NI YORU SUIGIN GANYU HAISUI NO SHOR NI KANSURU KENKYU. 2),
K. Nakamura, J. Ito, and M. Dazai.
Kogyo Gijutsuin Biseibutsu Kogyo Gijutsu Kenkyusho Kenkyu Hokoku, (Reports of the Fermentation Research Institute), No. 47, p 59-66, December, 1975. 10 fig, 1 tab, 3 ref.

Descriptors: *Mercury, *Waste water treatment, *Activated sludge, Measurement, Waste assimilative capacity.
Identifiers: Volatilization rate, Flameless atomic absorption.

Mercury removal in the treatment of waste water containing mercuric chloride by activated sludge has been studied. It was found that added mercuric chloride was reduced to metallic mercury and volatilized. It was also assumed that the use of the mercury volatilization rate was an appropriate index of activity. This further investigation was made to measure the mercury volatilization rate by flameless atomic absorption. The decrease in mercury concentration by adsorption to sludge and volatilization declined with decreasing sludge concentration. It was found, however, that 20 ppm of sludge was appropriate, and that a sludge concentration below 10 ppm, the amount of volatilized mercury decreased and accuracy of measurement was reduced. Optimum pH and temperature for mercury volatilization were from 8 to 9 and from 42 to 43 C, respectively. (See also W76-09017) (Kramer-FIRL)
W76-09018

CANADIAN CLARIFIER IS LOW IN COST,
Water and Pollution Control, Vol. 114, No. 2, p 27, February, 1976. 1 fig.

Descriptors: Equipment, *Waste water treatment, *Sewage treatment, *Design, Filtration, Canada, Suspended solids.
Identifiers: *Claripak, Clarification, *Clarifiers.

An economical and efficient alternative to the conventional clarifier has been designed in Canada. Called the Claripak, the unit has a capital cost of about one half that of a standard clarifier, and considerably reduced maintenance costs, due to the fact that there are no moving parts. The Claripak consists of a series of parallel stainless steel plates lying inches apart and set at a 45 degree angle. Influent, such as a mixture of hydrocarbons, suspended solids and water, is distributed evenly at the top and moves downward over the plate. A laminar flow pattern for improving the settling qualities of the solids is produced. Any hydrocarbon droplets move upwards, contact the upper plate and slide up past a knife-edge into an enclosed discharge channel. Those materials heavier than water move down to a lower plate, and slide into the sludge holding tank. The treated liquid passes through the unit into a collection chamber and flows upward to the outlet connection. The

Claripak can be applied both to industrial and municipal facilities. It is suitable for secondary and tertiary treatment at municipal water pollution control plants and for treating back wash wastes from filtration facilities. (Kramer-FIRL)
W76-09019

ADVANCED WASTE TREATMENT PLANT FEATURES NITRIFICATION,
Camp, Dresser and McKee, Inc., Boston, Mass.
J. E. Leu, and M. A. Reynolds.
Public Works, Vol. 107, No. 4, p 56-61, April, 1976. 3 fig, 2 tab.

Descriptors: *Waste water treatment, *Nitrification, *Treatment facilities, *Design criteria, Biological treatment, Sludge disposal, Landfills, Massachusetts, New England, *Tertiary treatment.
Identifiers: Physics-chemical treatment.

New England's first large, single-stage nitrification plant for waste water treatment has been planned for two communities along the Charles River in Massachusetts. It was concluded that a combination of physico-chemical and biological processes would be more efficient than either alone. A single-stage process was selected as simpler and more economical than a two-stage process. The possibility of ultimately serving a larger region was considered in the design criteria. The process steps selected were comminution, primary sedimentation, mechanical aeration, Secondary sedimentation, filtration, chlorination, and sludge processing. A filter press will be used to produce a dry sludge cake, which has advantages for landfilling. Onsite disposal as landfill is expected to be feasible until 1998. (Snyder-FIRL)
W76-09020

MODERN FILTER PRESS TECHNOLOGY FOR SEWAGE SLUDGE DEWATERING,
Edwards and Jones Ltd., Stoke-on-Trent (England).
A. S. Gunn.
Filtration and Separation, Vol. 13, No. 1, p 72, 74, 76, 78, 80, January/February, 1976. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Dewatering, *Sludge treatment, *Filters, *Water treatment, Lime, On-site tests, Wisconsin.
Identifiers: *Filter presses, Ferric chloride.

The Kenosha Water Utility plant in Wisconsin is the first American waste water treatment facility to use British filter presses and sludge dewatering technology. It has been performing at least equal to the design requirements. Sludge build-up was avoided, ensuring a more efficient waste water treatment works. Approximately 3% ferric chloride and 17% lime can be used to dewater raw mixed primary and activated, mixed digested and pre-thickened activated sludge within 2 hours. Average moisture content of the cake was always 60% or less. Full utilization of the plant can increase plant throughput. Success was achieved with in-line conditioning with a buffer tank system, but in-line macerators proved unsuccessful. With this type of automatic plant, periodic checking with C.S.T. of pH meters is useful and reliable in determining the chemical dosage and the conditioned sludge quality. If intensive site testing is performed, chemical filters are selected correctly, and modern equipment is used, it is possible for filter pressing to be effective, economical, and fully competitive with other municipal sludge dewatering methods. (Snyder-FIRL)
W76-09021

MUNICIPAL WASTE WATER TREATMENT BY ROTATING DISC METHOD (KAITEN ENBAHO NI YORU HISUI SHORI),
K. Nakayama.
Yosui to Haisui, (Journal of Water and Waste), Vol. 18, No. 1, p 37-46, 1976. 25 fig, 22 ref.

Descriptors: *Waste water treatment, *Biological treatment, Biochemical oxygen demand, Nitrification, Hydrogen ion concentration, Temperature, Dissolved oxygen concentration, Municipal wastes.
Identifiers: *Rotating discs.

Biological waste water treatment using a rotating disc process has several advantages, including simplicity of operation, flexibility with varying load of the input water, capability for advanced treatment of waste water, small electricity consumption for operating the system, and capacity for expansion of the existing system. BOD removal efficiency by the process decreases when the water temperature is less than 13 C. However, the efficiency does not change at temperatures between 13 and 30 C. The ideal pH for this treatment is between 6.5 and 8.5. The optimum rotation speed of the discs is 18 m/min for municipal waste water and 10 to 30 m/min for industrial waste water. Factors affecting nitrification in the rotating disc process are temperature, disc rotation speed, and dissolved oxygen content. Optimum conditions are the same as those in BOD removal efficiency. Nitrification is not affected if the dissolved oxygen content is greater than 0.5. (Katayama-FIRL)
W76-09022

AMMONIA NITROGEN REMOVAL FROM WASTE WATER EFFLUENTS BY ZEOLITE ION EXCHANGE AND ELECTROLYSIS COMBINATION (ZEORAITO NI YORU IONKOKAN-DENKAI NO KUMIAWASE NI YORU HAISUI KARANO AMMONIASEI CHISSO JOKYO),
T. Seiyama, T. Kitao, T. Hiasa, and H. Ishimaru.
Mizushori Gijutsu, (Water Purification and Liquid Wastes Treatment), Vol. 17, No. 2, p 135-147, 1976. 9 fig, 7 tab, 11 ref.

Descriptors: *Electrolysis, *Oxidation, *Waste water treatment, Nitrogen compounds, Ammonia, Zeolite, Ion exchange.
Identifiers: *Electrolytic oxidation.

The electrolytic oxidation of ammonia nitrogen was studied in the treatment of waste water using a zeolite to exchange ammonia ions. The ammonia ion fixed on the zeolite was eluted by sodium chloride solution, and electrolysis of the eluted solution was performed. This solution was then used to regenerate the zeolite, following adjustment of the sodium ion concentration. The electrolytic cell used five bi-pole electrodes, each of which consisted of six platinum electroplated titanium plates, 30 mm x 50 mm x 2 mm in size. Chlorine, hydrogen chloride, and nitrogen oxides gases generated during the electrolysis were absorbed by the sodium hydroxide solution which could be used to adjust the sodium ion concentration of the zeolite regeneration solution. Either a neutral or an alkaline pH was desirable for the elution solution, and the solution pH decreased with the electrolysis. The pH adjustment for the zeolite regeneration solution (thus the elution solution) could also be achieved by the sodium hydroxide solution used to absorb the gases generated during the electrolysis. The NaCl concentration required for the elution solution was more than one normal due to the electrolytic efficiency. In an application of the system, secondary treated sewage was treated with a zeolite which removed 90% of the ammonia nitrogen from the sample water; the electricity required to oxidize ammonia nitrogen in the zeolite elution solution was determined to be 35 to 46 KWH/kg N. (Katayama-FIRL)
W76-09023

MUNICIPAL WASTE WATER TREATMENT BY OZONE (OZON NI YORU TOSHIGESUI SHORI),
A. Takusagawa, T. Matsumura, and T. Fukuzuka.
Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol. 13, No. 140, p 51-58, January, 1976. 12 fig, 9 ref.

Descriptors: *Ozone, *Waste water treatment, *Tertiary treatment, Disinfection, Chemical oxygen demand, Color, Coliforms.

An ozone method has been studied for its decolorization, sterilization, and COD reduction effects, using tertiary treated sewage water. The COD removal efficiency was affected by the suspended solids concentration of the raw sample water. When sample water was filtered with a 3 micron pore filter paper, COD reduction with ozone treatment was about 23%; it was 48% when the sample water was filtered with one micron pore filter paper. Decolorization efficiency using the ozone treatment was very effective. A light yellow sample water could be completely decolorized by the ozone method in a short time, and the clarity of the treated water was comparable to that of drinking water. The degree of disinfection was determined by the number of coli group bacteria. No disinfection could be achieved with an ozone injection of 1.5 mg/liter water; however, nearly 100% of the coli group bacteria could be destroyed with an ozone injection of greater than 10 mg/liter water. A combination of ozone treatment with an electrolytic method and with an ultrasonic wave method were also studied for their effects on COD removal. The combination of ozone and ultrasonic waves did not increase the COD reduction efficiency. However, when ozone was injected between two electrodes during an electrolytic treatment, the COD reduction efficiency increased 1.5 to 2 times as compared to removal obtained with ozone alone. (Katayama-FIRL)
W76-09025

DECOLORIZATION OF NIGHT SOIL TREATMENT PLANT EFFLUENT BY OZONE (OZON NI YORU SHINYO SHORISUI NO DASSHOKU),
T. Kobayashi, H. Tachikawa, and Y. Eto.
Mizushori Gijutsu, (Water Purification and Liquid Wastes Treatment), Vol. 16, No. 11, p 1067-1073, November, 1975. 10 fig, 7 tab, 4 ref.

Descriptors: *Waste water treatment, *Ozone, *Tertiary treatment, Color, Chemical oxygen demand, Suspended solids, Coagulation, Effluents.
Identifiers: *Decolorization.

Tertiary treatment for the decolorization of domestic liquid wastes using ozone is described. Wastes which had received secondary treatment were used, and the color of the sample waste water ranged from 429 to 730. The waste water was treated in an aeration tank with bubbled ozonized air having a gas-liquid ratio of 15. By ozone flotation, up to 90% decolorization efficiency could be obtained. However, the removal efficiencies of COD, SS, and turbidity of the sample water were low, measured at a maximum of 45%, 50%, and 70%, respectively. Removal of COD and SS increased with increased ozone concentration; however, this increased ozone concentration raised the BOD level in the treated water. In order to have optimum ozone tertiary treatment, the use of coagulation before or after ozonization was necessary. Coagulation was found to be more economical before ozone treatment than after. The coagulation plus ozone tertiary treatment method gave removal efficiencies of 83.1%, 56.9%, 83.3%, and 87.6% for color, COD, turbidity, and suspended solids, respectively. (Katayama-FIRL)
W76-09026

DOUBLE FUNNEL WITH BAFFLE CASCADE AERATION UNIT,
Atara Corp., Montreal (Quebec). (Assignee).
D. S. Murphy.
United States Patent 3,931,370. Issued January 6, 1976. Official Gazette of the United States Patent Office, Vol. 942, No. 1, p 525, January, 1976. 1 fig.

Descriptors: *Waste water treatment, *Patents, *Aeration, Equipment, Sewage treatment, Aerobic conditions.

The design for an aerator for sewage has been patented. The apparatus is a double funnel with a baffled cascade aeration unit. It consists of an oxygen containing gas supply, two pairs of funnels, and baffle means. The oxygen containing gas supply means has two delivery orifices which cause the formation of two gas streams. The first two funnels converge downstream from the orifices so that the oxygen containing gas issuing from the orifice entrains liquids. The baffle means are located in the flow path between the exit from the first funnels and the entry to the second pair of funnels. The two pairs of funnels and the baffle means are secured together so that the mixture of oxygen containing gas and sewage leaving the first funnels impinges on the baffle. (Orr-FIRL)
W76-09027

GRAVITY SEPARATION OF COARSE SOLIDS IN WASTEWATER,
J. C. Lodholz, and H. Pentz.
Public Works, Vol. 107, No. 3, p 76-78, March, 1976. 5 fig.

Descriptors: *Solids removal, *Waste water treatment, *Separation techniques, Equipment, Pretreatment, Maintenance.
Identifiers: *Gravity separation.

Equipment for removing coarse solids in pre-treatment operations is discussed. The normal purpose of such equipment is to minimize wear on mechanical equipment in the subsequent treatment steps. Most equipment for removing coarse solids is designed for removing 65 mesh material. Adjustable weirs can control velocity in long flow-through grit chambers without aeration. The basis for designing aerated grit chambers is normally detention time. Coarse solids removal can affect the capability and effluent characteristics of the plant as a whole. Two inclined drag flight conveyor types may be used to handle heavy inorganic solids; the first has submerged sprockets, but only flights are submerged in the second. Aerated grit chambers are designed around other conveyor types, such as screw conveyors. Alternative methods of solids handling include scraper types in shallow settling tanks and cyclones in connection with screw washers. Monthly and yearly records should be kept of at least the volumes of coarse solids. Proper lubrication and maintenance of coarse solids removal equipment extends the life of other equipment in the plant. (Snyder-FIRL)
W76-09028

STUDIES OF HIGH-RATE BIOLOGICAL TREATMENT OF IPSWICH SEWAGE ON PILOT FILTERS USING PLASTICS MEDIA,
P. A. Banks, K. W. Hitchcock, and D. G. Wright.
Water Pollution Control, Vol. 75, No. 1, p 40-46, 1976. 2 ref.

Descriptors: *Filtration, *Waste water treatment, *Pilot plants, Suspended solids, *Biological oxygen demand, Sewage treatment, *Filters, *Biological treatment, Estuaries.
Identifiers: *High-rate biological filters.

High-rate biological filtration was investigated as a means of partially treating effluent to make it suitable to be discharged into an estuary. A pilot plant was used to study the new filter media, higher application rates, the nature and settlement of the sludge, the effects of varying the flow application frequency, and the required air access beneath the filters. Standards of 70 mg/liter suspended solids (SS) and 140 mg/liter biochemical oxygen demand (BOD) were proposed. Six biological filters which contain plastics could treat sewage at constant hydraulic loadings up to 10 cu m/cu m d with BOD loading as high as 3.5 kg/cu m d, producing an effluent with an average BOD between 70 and 80 mg/liter after settlement. The high-rate filter containing mineral media produced similar effluent quality operating at 4 cu m/cu m d hydraulic loading and 1.4 kg/cu m d BOD loading. The plastics media's specific surfaces did not affect the filter's BOD removal performance between 90 and 167 sq m/cu m. Treatment efficiency varied less with temperature than expected. The media characteristics did not affect the remaining SS concentrations in the filter effluents after quiescent settlement for 30 min. SS concentration averaged between 100 and 120 mg/liter, increasing slightly during spring. Modifications to the standard for SS have been considered. Surface dose rates of about 12 cu m/sq m d were satisfactory for distributions uniform enough to wet the top of the media adequately. High-rate filter performances were not affected by periodic liquid application at intervals of about 4 min. Full-scale high-rate biological filters containing high specific surface media can operate successfully without major provisions for ventilation. (Snyder-FIRL)
W76-09029

BASINGSTOKE SEWAGE TREATMENT WORKS, 1961-1975,
R. J. Axtell.
The Public Health Engineer, Vol. 4, No. 1, p 4-14, 22, January, 1976. 6 append.

Descriptors: *Sludge treatment, *Sewage treatment, *Treatment facilities, *Sewage, Sedimentation, Activated sludge, Sludge disposal, Aeration, Biological treatment, *Waste water treatment.
Identifiers: Basingstoke(England), Microstraining, Dry weather flow.

The design of the present sewage treatment works at Basingstoke is discussed. The Works were designed in 1960 to treat sewage from a population of 80,000 people and from existing and new industrial areas. Present standards of effluent are 8 mg/liter biochemical oxygen demand and 10 mg/liter suspended solids with an ammonia limit of 2 mg/liter in the summer and 5 mg/liter in the winter. The inlet works consist of a 51 inch bitumen lined steel sewer and two mechanically raked screens. Grit is removed with a horizontal flow circular detritor. Two storm water tanks are provided and designed to work in series. Radial flow settlement tanks are used for primary sedimentation because of the greater ease in controlling flow distribution. Sludge is drawn hydrostatically but experiments have been conducted using pneumatic desludging. This has increased sludge concentration from 4% to 5%. Aeration with diffused air is used in the biological treatment. The retention time for Stage 1 is 7 1/4 hours Dry Weather Flow (DWF) and is increased to 8 1/2 hours DWF in Stage 2 in order to increase the degree of nitrification. Activated sludge was returned by means of four air lift pumps with poor efficiency. They were replaced with a variable speed bowl pump. The use of screw pumps is recommended in the future. Circular tanks are provided for secondary settlement. Walls are scraped with chains and the sludge is withdrawn hydrostatically. Microstraining was adopted for tertiary treatment. In Stage 1 heated sludge digestion followed by drying on open beds was adopted. Some problems encountered in sludge treatment are discussed. (Pinto-FIRL)
W76-09030

WASTEWATER RESEARCH FACILITY DESIGNED FOR COMPARATIVE TESTING,
C. F. Clough.
Water and Pollution Control, Vol. 114, No. 1, p 17, 30, January, 1976.

Descriptors: *Waste water treatment, *Pilot plants, *Treatment facilities, Lime, Activated carbon, Flocculation, Sewage treatment, Testing, Testing procedures, Tertiary treatment.
Identifiers: Great Britain.

A pilot plant has been set up in Great Britain to evaluate advanced waste water treatment processes and equipment at a facility at the Coleshill Works of the Severn-Trent Water Authority. The Coleshill project is able to treat the waste in two separate complete water pollution control works in order to compare similar treatment methods. Sewage will be withdrawn from either or both of two sewers and industrial wastes may be added. Following preliminary screening and grit removal, flow control and balancing, the wastes will be passed to a movable treatment unit for advanced treatment. Reagents such as lime slurry or other flocculants are prepared in fixed equipment located near sludge dewatering facilities. The movable units will be used to experiment all types of treatment. Presently, the processes tested include liming, recarbonation, dual media filtration, and activated carbon. (Kramer-FIRL)
W76-09031

SEWER CLEANER FLUSHES OUT ACIDS,
For primary bibliographic entry see Field 8G.
W76-09032

MUNICIPAL WASTEWATER ODOR STILL A PROBLEM, PART 2,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
W. J. Hartman, and D. A. Long.
Water and Sewage Works, Vol. 123, No. 1, p 52-54, January, 1976. 1 fig, 33 ref.

Descriptors: *Odor, Municipal wastes, *Waste water treatment, *Waste water disposal, *Odor-producing algae, Chlorination, Microorganisms, Enteric bacteria, Bacteria, Sulfides, Treatment facilities, Air pollution, Chemical precipitation, Oxidation, Sludge disposal.
Identifiers: *Odor control.

Recent research has shown that coliform organisms can become airborne in moisture droplets after irrigation of golf courses with raw waste water. Microbes in soils and on the surface of growing plants have a minimal chance of survival. By following strict safety measures, the contamination of residential areas adjacent to irrigation areas can be avoided. It is concluded that the irrigation of land by sewage is hygienically safe as long as the operation is in the hands of well organized and well run companies. Air pollution associated with waste water treatment and disposal is difficult and costly to control. The main problem of waste water treatment plants is odor control. The oldest method of odor control is chlorination. Chlorine will both oxidize and disinfect. It must be applied before sulfide generation begins, and this may be in some remote part of the sewer system. Other oxidants such as ozone, chromates, manganese dioxide, and chlorinated and brominated hydrocarbons are also effective for controlling odors, but they are also expensive. Some metallic ions will precipitate with sulfide and be toxic to certain growths to control odors. Nitrates and molecular oxygen prevent the reduction of sulfate to sulfite, to control odors. Odors associated with sludge disposal can also reduce odors. Masking of odors is effective but costly. Microorganisms in the soil can reduce odors. Breaking up algae mats and the addition of pesticides will control odors in stabilization lagoons. (See also W76-05773) (Pinto-FIRL)
W76-09044

WATER PLANT WASTE TREATMENT: STATE OF THE ART, PART II,
Metcalf and Eddy, Inc., New York.
G. P. Fulton.
Public Works, Vol. 107, No. 2, p 57-60, 96, February, 1976. 2 fig.

Descriptors: *Waste water treatment, *Waste treatment, *Treatment facilities, Water treatment, Sludge treatment, *Lagoons, Dewatering, Cost analysis, Sewerage, Filtration, Centrifugation, Reviews.
Identifiers: Zero discharge.

The treatment of the waste element in water plant discharges is discussed. Present technology can come very close to accomplishing zero waste discharge. Only solids must then be removed from the water plant site. The Major problem in the treatment of water plant wastes is the conditioning of sludge so that it is suitable for discharge at a reasonable cost. The lagoon is the most common waste treatment facility in use, serving as the all purpose method for treatment. The lagoon installation is inexpensive but it requires a large land area and difficulty arises in removing the sludge. Discharging wastes to the sewerage system can cause two major problems. The hydraulic elements may not be able to handle the shock load of discharges like filter backwash and the treatment plant may not be able to handle the solids loading. Dewatering of water plant waste solids in sludge drying beds can be very effective where the climate provides long periods of little or no rainfall. Natural freezing on open beds has also proven to be an effective means of dewatering, again where the climate permits. Mechanical dewatering devices such as the centrifuge, the belt press, and the filter press, have been utilized with some success. For all three devices, preconditioning of the sludge is required. It may be economically feasible for some plants to recalcinate lime from the treatment process. The big problem the water industry faces is that the best practicable control technology currently available does not provide reasonable solutions for all water plant waste treatment situations. Several trends that can be expected in the future are discussed. (Pinto-FIRL)
W76-09045

APPARATUS AND PROCESS OF SEPARATING PACKING HOUSE WASTE,
D. C. Irwin.
U. S. Patent No. 3,947,355, 7 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2452, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, Water pollution control, Water quality control, Water pollution treatment, *Organic wastes, Oily water, *Oil pollution, Oil wastes, *Separation techniques.
Identifiers: *Packing house wastes, Tallow.

A vertically elongated tank is used as a container for separating light semi-liquid components from large volumes of contaminated water. Volumes of such water are passed into the container at a substantial distance below the zone where the components are initially separated so as to create a deep quiescent zone for the initial separation. A sloped and vertically elongated ramp is used to insulate the mass of material from the translating and agitating action of a series of scrapers. The scrapers are arranged to act only on the upper surface portions of the mass in the container to very limited depths. Each scraper is so supported as to provide, at its bottom edge, an upward, forward and centrally directed straight skewed or oblique line of contact with the sloped ramp upper surface while forming a line of contact with the wall of the container adjacent the ramp at the side edge of the scraper to repeatedly create V-shaped pockets with cleanable straight line edges. The pockets so formed serve to continually raise portions of the surface layers of the oily, semi-liquid tallow material on the ramp and to separate it from the liquid. The scraping elements are continually automatically cleansed of the adherent gum-like oily material by the continual passage of the scraper by cleansing elements located in the path of the scrapers. (Sinha-OEIS)
W76-09046

METHOD FOR BIOLOGICALLY TREATING SEWAGE AND AN INSTALLATION FOR CARRYING OUT THE METHOD,
Schreiber (August), Hanover (West Germany).
A. Schreiber, and B. Schreiber.
U. S. Patent No. 3,947,358, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2453-2454, March 30, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Water quality control, Water pollution treatment, *Aeration, Activated sludge, *Biological treatment, Circulation, Bubbles, *Treatment facilities.

An apparatus biologically treats sewage with aeration of a flowing sewage/activated-sludge mixture in an elongated circulation tank. It is divided by a longitudinally extending central partition terminating before and at a distance from the two end walls of the tank, into two parallel flow channels connected together at the ends, and the sewage is forced by aerators rotating near the base of the tank about a perpendicular axis of rotation on the longitudinal axis of the circulation tank, into a circulating flow about the axis of rotation and about the central partion. The circulating flow about the rotation is decelerated. By deceleration of the circulating of the circulating flow of sewage cause by the rotation of the aerators, the air bubbles issuing from the aerators are deflected from the perpendicular so that they have to travel a long distance in the sewage, with the result that the required, long residence time of the air bubbLes in the sewage is maintained. (Sinha-OEIS)
W76-09047

DIRECT CONTACT MULTI-STAGE FLASH DESALINATION,
Department of the Interior, Washington, D. C. Office of the Secretary.
For primary bibliographic entry see Field 3A.
W76-09052

PROCESS FOR ELECTROLYSIS OF BRINE,
Hooker Chemicals and Plastics Corp., Niagara Falls, N.Y. (Assignee).
E. H. Cook Jr, A. T. Emergy, and B. O. Schoepfle.
U.S. Patent No. 3,948,737, 6 p, 2 tab, 1 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 312, April 6, 1976.

Descriptors: *Patents, Water pollution sources, Industrial wastes, Water pollution control, Water quality control, *Electrolysis, Separation techniques, Chlorine, Alkalis(Bases), Anodes, Cathodes, Industrial production, *Brine, *Waste water treatment, Ion exchange, Membranes.
Identifiers: Alkali metal chlorides.

The invention provides a process for the electrolysis of aqueous alkali metal chloride solutions to produce chlorine and alkali metal hydroxides which provide relatively high anode and cathode current efficiencies while operating at reduced power consumption and which does not present waste disposal problems or require the use of purge streams to control impurity buildup. The process is described of electrolyzing an aqueous alkali metal chloride solution in a electrolytic cell having an anode compartment containing an anode, a cathode compartment containing a cathode and a substantially fluid impervious permselective cationic membrane barrier separating the anode and cathode compartments. The barrier consists essentially of a hydrolyzed copolymer of tetrafluoroethylene and a sulfonated perfluorovinyl ether. An aqueous alkali metal chloride solution is continuously flowed through the anode compartment of the cell while adding water to the cathode compartment of the cell and passing an electrolytic current between the anode and cathode. (Sinha - OEIS)
W76-09053

METHOD AND APPARATUS FOR SEPARATING OIL FROM AQUEOUS LIQUIDS,
W. F. Chapman.
U.S. Patent No. 3,948,767, 4 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 321, April 6, 1976.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, Oil pollution, *Oily water, Water pollution treatment, Water quality control, *Water pollution control, *Separation techniques, Flow, Pollution abatement.
Identifiers: Oleophilic granules, Fluidized bed.

A method and apparatus are provided for separating oily particles from an emulsion in an aqueous liquid. The emulsion is passed through a bed of oleophilic granules supported on a foraminous support. The oleophilic granules, by virtue of their density are fluidized by the passage of liquid through them. The oily particles are removed from the emulsion by the oleophilic granules in the bed, and the oily material accumulates and agglomerates and is transported out of the bed by the passage of liquid. The movement of the liquid then carries the oily droplets which are formed in the bed and deposits them upon a screen positioned downstream of the bed and the aqueous liquid passes through the screen in purified form. The oil accumulates on the screen and is propelled by the moving liquid into an oil reservoir positioned downstream of the screen. (See also W76-09055) (Sinha - OEIS)
W76-09054

METHOD AND APPARATUS FOR SEPARATING OIL FROM AQUEOUS LIQUIDS,
W. F. Chapman.
U.S. Patent No. 3,948,768, 5 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 321, April 6, 1976.

Descriptors: *Patents, Industrial wastes, *Waste water treatment, Oil pollution, *Oily water, Water pollution treatment, Water quality control, Water pollution control, *Separation techniques, Flow, Flow rates, Velocity, *Pollution abatement.
Identifiers: Oleophilic granules.

A method and apparatus are provided for separating fine oily particles from aqueous liquids at very high flow velocities by passing the mixture upwardly through an unconfined mass of oleophilic granules in a column with adequate velocity to separate and lift the individual granules into the upward flowing mixture within the column where movement of the individual granules serves to collect and coalesce the fine oily particles, and finally to release large oil drops back into the mainstream of the upward flowing mixture column. These large oil drops are then intercepted and extracted by a steeply inclined screen and caused to flow to storage in the form of a fine oil film propelled by the force of the flow of the aqueous liquid through the screen. (See also W76-09054) (Sinha - OEIS)
W76-09055

LIGAND EXCHANGE PROCESS FOR REMOVAL OF AMMONIA,
Environmental Protection Agency, Washington, D.C. (Assignee).
R. A. Dobbs.
U.S. Patent No. 3,948,769, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 322, April 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, Ammonia, Ion exchange, Separation techniques, Resins, Hydrogen ion concentration.
Identifiers: Regeneration, *Ligand exchange process.

A method for the selective removal of ammonia from aqueous solutions includes the preparation of an exchanger to render it suitable for a ligand exchange process, treating waste water with the treated exchanger, and regeneration of the exchanger to return it to a form suitable for removing ammonia from further batches of waste water. In the first step a suitable exchanger is treated with a solution containing a metal ion which forms a

complex with ammonia. Exchangers which are suitable include synthetic resins with carboxylic groups and inorganic hydrous metal oxides. Resins which contain carboxylic groups and inorganic exchangers of the hydrous metal oxide type have exchange capacities which are strongly dependent on the pH of the solution. As a result of loading the exchanger under strongly basic conditions, resins with carboxylic groups are more completely ionized and will contain more complexing metal ion at equilibrium. The inorganic hydrous metal oxides will exhibit higher capacities for the metal ion at elevated pH. This method of preparation results in greater ligand exchange properties for the exchanger and greater capacity for ammonia removal. In the regeneration step, the thermal process may involve hot air or water or low pressure steam. Low pressure steam is advantageous because it provides the ligand (water) to restore the resin for reuse. (Sinha - OEIS)
W76-09056

SPLIT STREAM ULTRAVIOLET PURIFICATION DEVICE,
S. Ellner.
U.S. Patent No. 3,948,772, 4 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 323, April 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, *Water purification, Disinfection, *Ultraviolet radiation, Opacity, Flow control.
Identifiers: *Ultraviolet water purification.

A split stream ultraviolet purification device is provided in which a selected amount of clear water is added to the inlet stream of opaque untreated liquid entering an ultraviolet purification chamber. The clear water dilutes the opaque untreated liquid sufficiently to assure that the ultraviolet radiation level transmitted within the purification chamber is of a dosage high enough to effect complete disinfection. The clear water is added to the inlet stream of opaque liquid by an electric mixing valve which is controlled by an ultraviolet monitoring system which receives a signal from an ultraviolet sensor located at the perimeter of the purification chamber. The electric mixing valve adjusts the flow of clear water in accordance with the requirements of the untreated liquid to maintain a predetermined level of ultraviolet radiation within the purification chamber. The discharge pipe of the purification chamber leads to a flow control valve which limits the liquid flow to a preset rate, thus preventing an undesired decrease in the ultraviolet dosage received by the liquid due to an increase in the flow rate. (Sinha - OEIS)
W76-09058

WATER PURIFICATION PROCESS AND APPARATUS,
Environment Improvement, Inc., Torrance, Calif. (Assignee).
W. E. Lindman.
U.S. Patent No. 3,948,774, 10 p, 14 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 323, April 6, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Water quality control, Water pollution control, Domestic wastes, Industrial wastes, Filtration, Iron, Filters, Flocculation, Sulfur compounds, Oxydation, *Water purification.
Identifiers: Barium ions, Sulfur dioxide gas, *Chemical treatment.

A process and apparatus is described for continuously obtaining separate outflows of pure water and sterile sludge when starting with various aqueous slurries containing organic or oxidizable contaminants. The flowing mixture is first treated with sulfur dioxide and iron under conditions of closely controlled acidity and in the absence of oxygen. The invention provides a multiple-stage, closed, operating system, a primary segment of which is characterized by a self-contained, continuously recycling oxygen-free gaseous flow comprising sulfur dioxide gas which moves through an iron reaction bed concurrent with the contaminant stream. Successive segments include continuously recycled oxygen-containing gas flow and closely monitored step-wise acidity control and utilization of free ions in consecutive neutralization and treating units, including introduction of barium ions by means of which potentially solid components are retained in solution or suspension until reaching the desired flocculation stage. The sequence includes units for automatic sludge removal, backflush cleansing of alternate filtering units during continued operation of the flow-treatment, use of a non-sparking ozone generator in association with particular air treatment lines, and final purification of exhaust air before venting. (Sinha - OEIS)
W76-09059

SEPARATION BY SOLVENT EXTRACTION,
Energy Research and Development Administration, Washington, D. C. (Assignee).
C. H. Holt, Jr.
U. S. Patent No. 3,949,048, 5 p, 1 fig, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 391, April 6, 1976.

Descriptors: *Solvent extractions, Aqueous solutions, *Patents, *Waste water treatment, Water pollution treatment, Water pollution control, *Water quality control, Waste water disposal, Waste disposal, Radioactive waste disposal, Waste storage, Freezing, *Separation techniques.
Identifiers: Fission products.

A process for separating fission product values from uranium and plutonium values contained in an aqueous solution is comprised of adding an oxidizing agent to the solution to secure uranium and plutonium in their hexavalent state. The aqueous solution is contacted with a substantially water-immiscible organic solvent and agitated while maintaining the temperature at from -1 deg to -2 deg C. until the major part of the water present is frozen. Three phases form; one solid ice consisting of pure water; the second phase is a relatively concentrated aqueous solution containing mainly the fission product nitrates; and the third phase is a hexone solution containing the bulk of uranyl and plutonyl nitrates. The phases are then separated. The concentrated aqueous phase which remains unfrozen and contains the bulk of the fission product values is made ready for waste disposal. For further concentration, the aqueous liquid is subjected to a distillation process where the bulk of the water is removed. The vapors distilled off in two concentration steps may be condensed and added to the liquid aqueous phase obtained after separation of the three phases and recycled through the process again. The remaining mixture is filled into stainless steel cylinders and inserted into a cask for disposal. (Sinha-OEIS)
W76-09061

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3E.
W76-09065

HYDROLOGIC ENVIRONMENTAL EFFECTS OF SPRAYED SEWAGE EFFLUENT, TALLAHASSEE, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W76-09134

TREATING SEWAGE AS A RESOURCE REVIVES INTEREST IN LAND DISPOSAL.
For primary bibliographic entry see Field 5E.
W76-09151

THERE IS SOMETHING NEW UNDER THE SUN,
D. A. Wilke.
Water and Wastes Engineering, Vol. 13, No. 3, p 18-22, March, 1976. 4 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Energy, Topography, Anaerobic digestion, Design, Heating, Maine.
Identifiers: *Solar energy.

The waste water treatment plant designed for Wilton, Maine, is totally energy conscious; its design uses a fully-integrated architectural/engineering approach, and the plant uses siting to a maximum. The site was chosen to make use of natural terrain for the process hydraulic gravity flow, and the surrounding topography was selected or altered to provide natural weather protection and reflect sunlight onto solar collecting surfaces from snow in winter. The process layout is arranged to eliminate some pumping requirements and conserve heat. The The building is well insulated from the outdoors and various areas of the building kept at different temperatures are insulated from each other. The materials were chosen to reduce energy use for heating and lighting and many require little energy in their manufacture. The anaerobic digesters use heat provided by solar energy. Pumps are used only to lift waste water into the plant. Heat from generator coolant, exhaust air, and effluent is recovered with a heat pump. The plant's high degree of self-sufficiency is especially an advantage due to the area's relative winter isolation. (Snyder-FIRL)
W76-09152

ANAEROBIC DIGESTION OF SOLID WASTE AND SEWAGE SLUDGE INTO METHANE,
Environmental Protection Agency, Washington, D. C. Office of Solid Waste Management Programs.
S. J. Hitte.
Compost Science, Vol. 17, No. 1, p 26-36, January/February, 1976. 3 fig, 1 tab, 9 ref.

Descriptors: *Anaerobic digestion, *Sewage sludge, *Solid wastes, *Methane, Costs, Industrial wastes, Municipal wastes, *Waste water treatment.

Anaerobic digestion is discussed as a means of producing methane from organic wastes to offset the natural gas shortage. This process is compared with use of solid waste as a supplemental fuel, pyrolysis, waterwall incineration, and hydrogasification. The current research on anaerobic digestion is summarized. Estimated costs are analyzed for a 1,000-ton-per-day organic waste digestion facility. The only current drawback to implementing such a system is the initial investment. Anaerobic digestion could, if it attains applicable technology stages, maximize conversion of organic wastes into fuel; facilitate materials recovery; handle some industrial wastes and animal and crop wastes mixed with sewage sludge and municipal solid waste; and operate without causing air pollution. The processes will remain separated, however, until the various components, which are already available, are joined into a congruent system for treating both solid waste and sewage sludge. (Snyder-FIRL)
W76-09153

PROCESSES MAKE SEWAGE COME CLEAN MORE CHEAPLY.
Engineering News-Record, Vol. 196, No. 1, p 17, January 1, 1976.

Descriptors: *Waste water treatment, *Sewage treatment, *Activated sludge, *Activated carbon, Aeration, Gamma radiation, Pilot plants, Costs, Pennsylvania.
Identifiers: Philadelphia(Penn).

Two variations of conventional sewage treatment techniques have been developed which may enable cities to stretch their funds allocated to water pollution control. Philadelphia, Pennsylvania, is currently testing an activated sludge system which uses an aerator designed to increase air transfer and reduce retention time. The system can reduce capital costs of a full-scale facility by 35 to 40% when compared with conventional aerators, operating costs by 10%, and land requirements by 15%. A 55 gal prototype tested by Philadelphia achieved BOD removals up to 99% on raw sewage containing 200-300 ppm BOD. The system is comparable to a pure oxygen-activated sludge system in performance, power and land requirements but is a simpler system without the disadvantages of the complicated technology of pure oxygen systems. In addition, a plant with conventional aerators is easily converted to one of this type. The second innovative technique is an activated carbon system in which the step needed to reactivate carbon filters after saturation is eliminated. Instead, the system is continually subjected to gamma radiation which induces oxidation of the organics that are held on the carbon. Before the waste water is passed through the carbon filter-irradiator, it is injected with oxygen and ozone. The system has been tested since 1973 at a pilot plant in Marietta, Georgia. Organic concentrations ranging from 100 to 1150 ppm have been consistently reduced by 95%. (Orr-FIRL)
W76-09154

COMBINATION OF PHYSICAL CHEMICAL PROCESSES OF WASTE WATER PURIFICATION WITH OZONE TREATMENT (KOMBINATION PHYSI-KALISCH-CHEMISCHER VERFAHREN DER ABWASSER-REINIGUNG MIT OZON-BEHANDLUNG),
K. R. Dietrich.
Chemiker-Zeitung, Vol. 100, No. 2, p 68-71, 1976. 1 fig, 2 tab, 3 ref.

Descriptors: *Organic compounds, *Waste water treatment, *Ozone, Municipal wastes, Industrial wastes, Chemical precipitation, Flocculation, Adsorption, Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: *Physico-chemical treatment.

A method has been developed for the decomposition of organic wastes. The process involves the steps of physico-chemical treatment, precipitation, flocculation, adsorption, and flotation, together with an ozonization step. The precipitation/flocculation/adsorption/flotation step removes at least half of the organic compounds from the waste water; the remainder is decomposed by ozone in a second step. Color and odor are removed and stringent BOD and COD requirements will be met. The system has been applied to the treatment of both industrial and municipal waste water. (Kramer-FIRL)
W76-09156

HOW TO DESIGN AERATED LAGOON SYSTEMS TO MEET 1977 EFFLUENT STANDARDS EXPERIMENTAL STUDIES,
South Carolina Dept. of Health and Environmental Control, Columbia.
S. C. White, and L. G. Rich.
Water and Sewage Works, Vol. 123, No. 3, p 85-87, March, 1976. 8 fig, 1 tab.

Descriptors: *Aerated lagoons, *Waste water treatment, *Suspended solids, Aerobic treatment, Sedimentation, *South Carolina.

Experimental studies on controlling suspended solids in effluents of aerated lagoon systems are being carried out in South Carolina in two phases. One phase is a field study of the characteristics of the solids in the influents and effluents of polishing ponds of several existing aerated lagoon systems. In this phase, samples were taken of the effluents and influents of six lagoon systems on five different days in a dry weather period in late summer. During the period studied, effluents did not consistently meet the standard for suspended solids, 30 mg/liter. Some polishing ponds actually increased the concentration of suspended solids. A correlation exists between algae in aeration cells and power level. The non-algal portions of the suspended solids in the effluents apparently meet the standard of 30 mg/liter. A laboratory study was performed to determine how biological solids' settling characteristics change with the mean solids retention time. In this experiment, a given volume of synthetic waste water was added daily to an aerated cone to replace an equal volume of the contents, which was wasted. The settling characteristics of biological solids for a given waste water are affected by both the mean solids retention time and suspended solids concentration. At 22 and 23C, mean solids retention times of 4 and 5 days produced optimal settling characteristics for relatively high suspended solids concentrations. Times of about six days produced optimal settling for more dilute concentrations. (Snyder-FIRL)
W76-09157

DESTRUCTIVE AIR DEODORISATION AT A DUBLIN SEWAGE WORKS,
W. Summer.
Process Biochemistry, Vol. 11, No. 1, p 26-27, January/February, 1976.

Descriptors: *Odor, *Sewage treatment, *Hydrogen sulfide, Ozone, Oxygen, Ultraviolet radiation.
Identifiers: Deodorization, Dublin(Ireland).

Sewage odors emanating from the end point of waste collection pipeline at the Sewage Pumping Station, Dublin had caused an environmental problem. Such sewage air contains indole or benzopyrrole (C_8H_7N), skatole or methylindole (C_9H_9N) and hydrogen sulfide. Ozone had been generated at the Pumping Station by means of a silent electric discharge in a chamber through which air was passed. This method proved ineffective, and a new system was designed in which the foul air is passed through a radiation field of defined wavelengths and intensity, so that nascent oxygen atoms will form and attach themselves to the organic molecules, thus oxidizing them. Surplus oxygen will form ozone, indicating that the deodorization is complete. The radiation field is produced by ultra-violet generators of the monokymatic mercury discharge type. The advantage of producing nascent oxygen atoms is that there is a gap in the absorption spectrum of nitrogen where the emission of ultraviolet energy is a maximum; thus no nitrous gas contaminants will be formed by the breakdown of nitrogen molecules into atoms. Using five reaction chambers in series, this method has been employed to treat a sewage air flow of up to 5000 cu m per hour. (Kramer-FIRL)
W76-09158

REVIEW OF ADVANCED TREATMENT TECHNIQUES FOR WASTE WATER,
Water Pollution Research Lab., Stevenage (England).
R. W. Bayley, and P. F. Cooper.
Berichte der Abwassertechnischen Vereinigung e.V., No. 28, p 245-258, 1976. 5 fig, 6 tab, 16 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, *Nutrient removal, Phosphorus, Nitrogen, Activated sludge, Anaerobic conditions, Reviews.

Conventional methods of waste water treatment, while successful in some respects, remove little nitrogen and phosphorus from the wastes and are poorly adapted to sudden changes in waste water. Alternative treatment methods are being studied to remedy these problems. The activated sludge process has been modified to remove significant amounts of oxidized nitrogen from final treated effluent. Some existing plants would be able to use this method. The modified process would require additional mixed-liquor tank capacity to accomodate anoxic reactors, but its costs would probably be outweighed by the resulting savings in aeration equipment costs. High quality water may be obtained using commercially available reverse osmosis equipment. Application of the process is seriously restricted, however, by the costs involved in maintaining the high operating pressure required. This situation could be changed markedly by the development of new membranes operating at lower pressures. Several chemical methods of primary treatment have been examined, but problems have been encountered. Adsorption onto activated carbon does not efficiently remove all of the soluble organic matter present in sewage. Urea also persists in sewage, and limiting the nitrogen in the final effluent may require biological processes. (Snyder-FIRL)
W76-09159

PRESTON SEWAGE LIFT STATION MEETS FLUCTUATION IN FLOW,
For primary bibliographic entry see Field 8C.
W76-09160

WASTEWATER PLANT WILL USE NO CHEMICALS FOR SLUDGE CONDITIONING,
Camp, Dresser and McKee Inc., Boston, Mass.
J. Josti.
Water and Sewage Works, Vol. 123, No. 3, p 66-69, March, 1976. 4 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Sludge treatment, *Disinfection, Sodium compounds, Activated sludge, Connecticut.
Identifiers: Waste activated sludge, Sodium hypochlorite, New Haven(Conn).

The new East Shore waste water treatment plant in New Haven, Connecticut, will not use chemicals to condition sludge and will produce the sodium hypochlorite it uses for disinfection. The facility was designed for 40 mgd daily average flow and 100 mgd peak hourly flow. The equipment for treating the waste water will include a wet well, five vertical centrifugal pumps, four comminutors, primary sedimentation tanks where sludge, grit, and scum will be removed, aeration basins, final sedimentation basins, and two chlorine contact basins. The grit will be incinerated, and the scum and the primary sludge will be mixed. Normally, equal amounts of primary thickened sludge and waste activated sludge will be blended with some scum in a blend tank. After oxidation, the dewatered blended sludge will be incinerated. An economic analysis showed that producing sodium hypochlorite on site was the least expensive type of disinfection system. The sodium hypochlorite will be produced by electrolysis of screened, warm seawater used for cooling at a nearby electric generating station. Laboratory areas, personnel areas, and plant controls, as well as various process units, will be housed in the process building. An illuminated panel indicating the status of various units, a logging typewriter, a cathode ray tube alarm, and various controls will enable the operator to observe and control the process. (Snyder-FIRL)
W76-09161

CHEMICAL FEED: IT'S A WAY OF LIFE AT WINDSOR,
Water and Pollution Control, Vol. 114, No. 3, p 6-7, March, 1976.

Descriptors: *Nutrient removal, *Sewage treatment, *Chemical precipitation, *Polymers, De-

watering, Sludge treatment, Polyelectrolytes, Phosphorus, Canada.
Identifiers: Windsor, Ontario(Canada).

The city of Windsor, Ontario, is attempting to economize the costs of Ontario's program for nutrient removal in its sewage treatment plants. Much work has been directed toward ensuring that chemicals are added proportionately to flow. Three of the city's projects use dry chemical feed; two use liquid chemicals. Dry polyelectrolytes are wetted before use. The particles are then mixed in solution and transferred to a feed tank. A meter controls application of the polymer solution from this tank. Switching to chemical treatment increased the quantity of sludge and changed its composition. Various polymers are being evaluated to correct the problem. The city also uses ferric chloride and lime for dewatering. Another project adds a phosphorus removal chemical directly to raw sewage, reducing biochemical oxygen demand loading and increasing sludge volume. This sludge is dewatered by centrifugation. Polymer effectiveness varies between the city's two sewage plants, depending upon the characteristics of the raw sewage. (Snyder-FIRL)
W76-09162

ALUM SLUDGE FROM WATER PLANT CONDITIONS SEWAGE SLUDGE,
Wayne State Univ., Detroit, Mich. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W76-09163

REVERSE OSMOSIS SEPARATION OF POLAR ORGANIC COMPOUNDS IN AQUEOUS SOLUTION,
Illinois Univ. At Urbana-Champaign. Dept. of Civil Engineering.
H. H. P. Fang, and E. S. K. Chian.
Environmental Science and Technology, Vol. 10, No. 4, p 364-369, April, 1976. 8 fig, 4 tab, 19 ref.

Descriptors: *Reverse osmosis, *Waste water treatment, *Organic wastes, Membrane processes, *Membranes, Separation techniques, Aqueous solutions, *Desalination.

Reverse osmosis was studied as a means to separate polar organic compounds from water. Thirteen polar organic compounds with low molecular weight, consisting of various functional groups, were used to test 12 reverse osmosis membranes. These compounds were separated less effectively than inorganic salts by all membranes tested. The aromatic-polyamide-(AP)-, NS-type, and cellulose acetate base membranes gave overall polar organic compound separations of 50%, 75%, and between 13% and 27%, respectively. The chemical nature and characteristics of both the molecule and the membrane determine the separation of a particular organic compound by a given membrane. Compounds with any given functional group are separated increasingly as the molecule size and branching increase. The overall separations obtained experimentally can be considered as minimum values when applying reverse osmosis in waste water treatment. (Snyder-FIRL)
W76-09165

WATER SUPPLY AND SEWAGE TREATMENT IN ARID AREAS,
Water Services, Vol. 80, No. 960, p 79-80, February, 1976.

Descriptors: *Waste water treatment, *Water supply, *Water sources, *Sewage treatment, Desalination, Oxidation lagoons, Filtration, Potable water, Water treatment, Asia.
Identifiers: Middle East.

Sewage treatment and water supply pose special problems in areas like the Middle East, in which potable water is scarce due to special environmental and geographical factors. The characteristics of the water and sewage may also be different from those found in other areas. Possible water sources include: springs, deep boreholes, and protected catchments; treated water from unprotected catchments, rivers, lakes, and water holes; and desalination of water from oceans and saline wells. Possible methods of sewage treatment include oxidation ponds, percolating filters, tertiary treatment lagoons, and sand filters. Preliminary polluted water treatment in remote areas should be simple, avoiding open storage tanks and reservoirs, with suitably treated water being used to reclaim desert land for agriculture. A need for practical guidance exists in the remote areas, due to unfamiliarity with proper treatment facilities. Although there are many plans for treatment of water and sewage in parts of the Middle East, good water supplies are virtually unknown in many areas. (Snyder-FIRL)
W76-09166

THE USE OF OXYGEN IN THE TREATMENT OF WASTE WATER,
Water Pollution Research Lab., Stevenage (England).
Notes on Water Research, No. 1, p 1-4, December, 1975. 28 ref.

Descriptors: *Oxygen, *Activated sludge, *Aerobic treatment, *Dissolved oxygen, *Waste water treatment, *Oxygenation.
Identifiers: Oxygen activated sludge.

Sufficient dissolved oxygen is essential for aerobic biological treatment of waste water. Using oxygen rather than air increases the rate at which oxygen is dissolved almost fivefold. Oxygen is produced commercially by fractional distillation of liquified air. Oxygen-enriched air is produced by pressure-swing adsorption (PSA), in which nitrogen is adsorbed from air using a zeolite. The relative costs and power requirements of PSA and the cryogenic process depend on the plant size. The techniques for more efficient oxygen use in the activated-sludge process include: agitation of oxygen and mixed liquor in a covered tank for several hrs prior to separating the effluent and sludge in a conventional sedimentation tank; releasing oxygen at the bottom of the tank; temporarily separating a side-stream of liquor into which oxygen is injected under pressure; and injecting the oxygen into a mixed liquor stream flowing downward. The advantages claimed for treating waste water with oxygen include dissolving oxygen in the mixed liquor rapidly enough that dissolved oxygen does not limit the biochemical oxidation rate; possible reduction of aerial nuisance with covered tanks; better settling characteristics and smaller quantities of sludge; and reduction of the possibility of sludge bulking. The disadvantages of oxygen use include reliance on either complex equipment or an external manufacturer, greater energy use to produce and dissolve oxygen, the need to modify the process to achieve nitrification in single-stage plants, and possible hazards in using and storing oxygen. (Snyder-FIRL)
W76-09167

SEWERAGE PROJECT ON UPSTREAM AREA OF THE YAMATO RIVER,
Nara Prefecture Sewerage Dept. (Japan).
M. Yamada.
Civil Engineering in Japan, Vol. 14, p 122-132, 1975. 4 fig, 2 tab.

Descriptors: *Waste water treatment, *Activated sludge, *Treatment facilities, Sewerage, Water pollution control, *Settling basins, Aeration.
Identifiers: *Yamato River(Japan).

The Yamato River's upstream area is in a mountainous area of Nara Prefecture, one of Japan's historic and scenic areas. A regional sewerage project administered by the prefectural government was begun in 1970 to alleviate a pollution problem which had become apparent in the river. A treatment center was built in a low area surrounded by mountains, so that a natural flow system can be used. Treatment is based on the activated sludge process. Circular radial-flow type primary settling tanks are used. The aeration tank can be used for step aeration or tapered aeration as the load changes. Only the final settling tank is not enclosed. As much as possible of the operation is automated. Only about half of the treatment center site is used for present needs. The remainder is used as a recreation area. (Snyder-FIRL)
W76-09168

REVERSE OSMOSIS TODAY,
Process Biochemistry, Vol. 11, No. 1, p 32-34, January-February, 1976. 3 fig, 2 tab.

Descriptors: *Reverse osmosis, *Water treatment, *Waste water treatment, *Desalination, Membrane processes, Water reuse, Membranes.
Identifiers: Membrane configurations.

Representatives of various industries participated in a 2 day seminar on principles, applications, and limitations of reverse osmosis. Techniques and membrane configurations discussed include the plate and frame technique, the spiral wound technique, the tubular technique, the spaghetti technique, and the hollow fiber technique. For all of these techniques, water should not exceed stipulated pH, temperature, and chlorine levels or contain excessive hardness, particulate matter, dissolved iron, or colloidal matter. The membranes reject organic molecules with high molecular weights, including nearly all viruses and pyrogens. Reverse osmosis reduces salt by approximately 90 to 95% independently of total dissolved solids levels under approximately 1500 ppm for most waters. Because reverse osmosis is compact, it is sufficiently mobile for treating drinking water in emergencies. Use of reverse osmosis in waste water treatment is expected to increase; it can provide for recycling of effluents when combined with filtration and ion exchange. It is expected that reverse osmosis will also be used for desalination of sea water. Reverse osmosis has been used for 18 mo virtually without problems to purify water for a soft drink manufacturing plant. Another factory obtained sufficiently pure water with reverse osmosis for use in manufacturing tablets. Reverse osmosis systems must be matched to local conditions such as turbidity, water hardness, and colloid levels. (Snyder-FIRL)
W76-09169

PACKAGE SEWAGE TREATMENT PROCESS,
M. J. Martin.
Process Biochemistry, Vol. 11, No. 1, p 29-30, January-February, 1976. 1 fig, 1 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, Aeration, Activated sludge, Denitrification, Nitrification, Anaerobic conditions, Automation.
Identifiers: *Package plants.

The Degremont Diapac U. I. sewage treatment system is designed to serve populations of 100 to 30,000 inhabitants. Operation is automated as much as possible. The plant contains two compartments for aeration, clarification, or both as well as equipment for pumping and screening raw sewage. It may be extended to meet future requirements. The treatment system, which operates as an extended aeration activated sludge process, makes use of the fact that activated sludge from such a process can undergo relatively long periods with no aeration. It uses the same unit for nitrification and denitrification. The two compartments alternate between aeration and solids/liquids separation. A timer mechanism controls the change of functions. (Snyder-FIRL)
W76-09170

REMOVAL OF FAECAL COLIFORM FROM WASTE WATER BY PROPER AEROBIC BIOLOGICAL TREATMENT,
Notre Dame Univ., Ind. Environmental Health Engineering.
R. H. L. Howe.
Process Biochemistry, Vol. 11, No. 1, p 18-19, 24, January-February, 1976. 1 tab, 16 ref.

Descriptors: *Waste water treatment, *Aerobic treatment, *Coliforms, *Biological treatment, *Public health, Biochemical oxygen demand, Chemical oxygen demand.

Public health protection is the most important reason for waste water treatment. An initial principal objective of aerobic biological waste water treatment is the removal or reduction of bacteria. Biological flocculation, which brings bacteria together into a biological mass as a part of aerobic biological treatment, makes it possible to separate them mechanically. Undesirable anaerobic bacteria cannot survive in the aerobic environment provided by aerobic biological oxidation. Some microorganisms interfere with certain other bacteria's survival. The effluents from trickling filter, activated sludge, or anaerobic digestion contain smaller numbers of all microorganisms present in the sewage before treatment. These microorganisms will be more concentrated in the accumulated solids than in the liquid portion. Removal of microbes parallels biochemical oxygen demand and chemical oxygen demand, and microbial density, especially that of coliform, is likely to be at a minimum when they are at a minimum. Coliforms can occur in waste water that does not contain sanitary sewage. (Snyder-FIRL)
W76-09171

MICROBIOLOGY AND ACTIVATED SLUDGE,
Water Pollution Research Lab., Stevenage (England).
G. L. Jones.
Process Biochemistry, Vol. 11, No. 1, p 3-5, 24, January-February, 1976. 3 fig, 1 tab, 6 ref.

Descriptors: *Activated sludge, *Microorganisms, *Kinetics, *Waste water treatment, *Microbiology, Bacteria, Protozoa, Biomass.

Waste water is treated biologically by bringing it into contact with suitable microorganisms for a sufficient period of time for the microorganisms to metabolize the polluting constituents to the required extent. Maintaining a high bacterial mass concentration in the aeration tank and a low substrate concentration in the effluent produce cultural conditions resembling those near the end of a batch culture with nearly exhausted substrate, minimal bacterial growth rate, and possibly decreased viability of the culture. The bacterial population in activated sludge is predominantly moribund, but biochemical oxygen demand (BOD) in sewage can be removed without viable bacteria. Protozoa are also present in activated sludge systems, their role being primarily concerned with clarifying the final effluent. The rate of sludge removal from the system is very important in controlling activated sludge. The obtainable degree of treatment and the quantity of biological solids produced from the BOD applied to the system depend on it. The most common, and probably most successful, kinetic models of activated sludge, have been pragmatic models describing the overall plant performance in terms of a non-specific parameter such as BOD on first-order kinetics. Most microbiological models do not account for the relatively low proportion of viable bacteria in activated sludge. Settlement and recycling are used to increase the concentration of biomass in contact with the waste water. This serves two purposes: increasing the rate of waste water purification; and, reducing the amount of biological solids produced from the BOD removed. (Snyder-FIRL)
W76-09172

EVALUATING ROTATING BIOLOGICAL CONTACTOR PERFORMANCE,
Weston (Roy F.), Inc., West Chester, Pa.
E. L. Stover, and D. F. Kincannon.
water and Sewage Works, Vol. 123, No. 3, p 88-91, March 1976. 8 fig, 1 tab, 4 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Organic loading, Flow rate, Chemical oxygen demand, Dissolved oxygen, Efficiencies, Performance.
Identifiers: Rotating discs.

The relationship of the organic concentrations and flow rates of a synthetic carbohydrate waste water and an industrial waste water and their influence on the removal of organics in a rotating biological contactor were investigated. A 4 ft long pilot system with 10 gal capacity was used in the investigations. Microbial populations were started in the waste water with an initial seed of sewage from a sewage treatment plant. Waste water was pumped into the first treatment stage, from which it flowed through the following five stages. Samples were collected at the influent line and at the end of every stage, and their pH, dissolved oxygen, influent and effluent temperatures, and chemical oxygen demand were measured. Increases in organic concentration and flow rate caused decreases in removal rates and treatment efficiencies. First-order decreasing removal rates at each stage characteristic of the process for both types of waste water. The rotating biological contactor's response to treatment of various waste waters varies with the constituents and characteristics of the waste waters. The removal efficiencies approach constant minimum values as the organic loadings increase. (Snyder-FIRL)
W76-09173

THE EFFECT OF FLOCCULANTS ON POST-COAGULATION SLUDGE DEWATERING (WPLYW FLOKULANTOW NA ODWADNIALNOSC OSADOW POKOAGULACYJNYCH),
A. Grossman, H. Koscielniak, W. Kusznik, and W. Pawlita.
Inzynieria Sanitarna, Vol. 19, No. 443, p 103-117, 1976. 3 fig, 2 tab, 9 ref.

Descriptors: *Flocculation, *Sludge treatment, *Dewatering, *Filtration, Measurement, *Waste water treatment, Coagulation.

The effects of flocculants on the resulting sludge and its dewaterability characteristics following coagulation were investigated. Studies were performed on commercial and laboratory scales to determine an adaptation of a method of filtration resistance measurement commonly used to estimate sludge characteristics, as well as to determine the effect of different combinations of reacting substances used in coagulation on the degree of sludge dewatering. It was found that the known method of measurement of waste water sludge filtration resistance is applicable to testing post-coagulation sludge dewatering. The proper selection of a filter size had a significant effect on the filtration resistance measurement and filter cloth BT-103 was useful for this measurement. In addition, application of flocculating agents in combination with the coagulant lowers the coefficient of the post-coagulation sludge filtration resistance. (Kramer-FIRL)
W76-09174

EFFECTS OF ACTIVATED CARBON ADDITION TO THE ACTIVATED SLUDGE PROCESS (WPLYW DODATKU WEGLA AKTYWNEGO DO PROCESU OSADU CZYNNEGO),
J. Suschka, and I. Pusz.
Inzynieria Sanitarna, Vol. 19, No. 443, p 19-32, 1976. 12 fig, 4 ref.

Descriptors: *Activated carbon, *Activated sludge, *Aeration, *Waste water treatment, Laboratory tests, Biochemical oxygen demand, Chemical oxygen demand, Nitrification, Aeration lagoons.

Laboratory scale experiments were performed to study the effect of the direct addition of activated crbon to the aeration tank in the activated sludge process. A definite increase in the removal of biochemical oxygen demand (BOD) was noted. However, no significant changes in the effectiveness of COD removal with the added activated carbon could be observed. Also, the nitrification process was slowed in the experimental activated carbon unit. (Kramer-FIRL)
W76-09175

NEWMARKET'S REPLACEMENT SEWAGE TREATMENT WORKS,
Water Services, Vol. 80, No. 959, p 50-51, January, 1976.

Descriptors: *Waste water treatment, *Treatment facilities, *Sewage treatment, Storm water, Flow rates.
Identifiers: Great Britain(Newmarket).

A new sewage treatment works recently replaced the town of Newmarket's original works in Great Britain. The works will serve a population of 20,000 initially, and can be expanded to serve 30,000. One tenth mgd of the design dry weather flow of 1.1 mgd represents flows from the village of Exning. The primary settlement and storm water tanks are located at an intermediate level between the aeration tanks and the incoming sewer, resulting in two pumping stages with screw pumps. All sludge is transported nine miles to Cambridge's works for final treatment. Newmarket's main flows pass through a measuring flume incorporating emergency overflow channel. After they are pumped to the first level and joined by sewage from Exning, grit is removed in aerated grit channels. The channel conveying the sewage to the sedimentation tanks has an overflow channel in case the second stage pumping should fail. The primary sedimentation tanks have continuously revolving scrapers sweeping sludge into a sump from which it is discharged. The flows are then pumped to two adjoining aeration chambers. The effluent is gravity fed from the aeration chambers to two settlement tanks providing the last stage of treatment. Activated sludge from these tanks is recirculated. Combined secondary and primary sludge discharged from the primary tanks flows by gravity to sludge storage/thickener tanks which hold it until delivery to Cambridge. These tanks have fixed bridge stirrers, helping to release supernatant water. (Snyder-FIRL)
W76-09176

COMBINED UTILITY PROVIDES WATER AND WASTEWATER TREATMENT.
Water and Sewage Works, Vol. 123, No. 2, p 70, February, 1976.

Descriptors: *Waste water treatment, *Water treatment, *Treatment facilities, Hydrogen sulfide, Iron, Chemical precipitation, Chlorination, Construction costs, Florida.
Identifiers: Combined treatment.

A new facility near Boynton Beach, Florida, will soon begin treating both water and waste water. It is designed to serve 4,740 units in two developments. Water is pumped from two wells, and must be treated to remove iron and hydrogen sulfide. The water is aerated and lime, alum, and certain polyelectrolytes are added. Mechanicl scrapers collect the precipitate which is produced. The system collects the effluent through radial launderers and passes it through a medium of polishing sand, graded gravel, and anthrafilt. Two pumps distribute the water among the four cells containing the medium. A contact stabilization unit having extended aeration capabilities is used to treat the waste water. The waste water being treated will be almost entirely domestic. After the effluent is

treated and chlorinated, it is conducted to two oxidation ponds. From there it will enter two transpiration-evaporation ponds. Construction costs total approximately $2.1 million, not including engineering land land. Palm Beach country will take over the utility when it is completed. (Snyder-FIRL)
W76-09177

REGINA TERTIARY TREATMENT PLANT STUDY AND DESIGN, PART I, CASE HISTORY,
M. J. Stewart, and D. H. Lewis.
Water and Pollution Control, Vol. 114, No. 3, p 28-32, 34-35, March, 1976. 3 fig, 2 tab.

Descriptors: *Tertiary treatment, *Waste water treatment, Nitrate, Phosphate, River, Waste disposal, Chemical precipitation, *Treatment facilities, Nutrient removal, Pilot plants, Design, Canada.
Identifiers: Regina(Canada), Qu'Appelle River basin.

A 1972 study showed that the waste water treatment works for the city of Regina, Canada, contributed substantial amounts of nitrogen and phosphate to local rivers. The capacity of these treatment works had been increased in 1970 by adding two series-flow aerated cells. A research program on tertiary treatment was undertaken to evaluate chemically treating stabilization pond effluent used with a settling-tube module, high-rate, upflow clarifier. There was a need for developing an economical means to improve the effluent from stabilization ponds. A pilot plant was constructed in 1971. Its main features include flow control, rapid mix, chemical feed, flocculation, and high-rate clarification facilities. It received effluent from the City's outfall line before chlorination and returned waste sludges and treated flows to the outfall. Various dosages of alum and lime were tested between September and December 1971. Further tests at warmer temperatures were performed between May and July 1972. Higher flow rates, removal of the settling-tube module, and two sampling methods were studied. Samples were tested onsite for pH, color, temperature, alkalinity, turbidity, and hardness and for other characteristics at the University of Saskatchewan. The approximate weight of algae in samples from the stabilization pond could be determined by multiplying the measured concentrations of chlorophyl by 0.05. (Snyder-FIRL)
W76-09178

THE PERFORMANCE-POTENTIAL OF POLYELECTROLYTES AND HIGH VELOCITY GRADIENTS IN THE TREATMENT OF WASTEWATERS,
Ife Univ., (Nigeria). Dept. of Agricultural Engineering.
O. Ogedengbe.
Water Research, Vol. 10, No. 4, p 343-349, 1976. 5 fig, 6 tab, 11 ref.

Descriptors: *Polyelectrolytes, *Waste water treatment, *Sewage treatment, Coagulation, Performance, Cations, Turbidity.
Identifiers: Alum, Sodium aluminate.

The use of cationic polyelectrolytes for treating domestic sewage was studied at various velocity gradients and periods of rapid mixing, both with and without coagulantaids. Slow mixing and settling followed the rapid mixing. Velocity gradients as high as 500/sec may be desirable for waste water treated with cationic polyelectrolytes. Rapid mixing periods as long as about 25 min also may be desirable. Use of bentonite clay as a coagulant aid improved the turbidity removal, but aluminum sulfate and sodium aluminate were even more effective. Sedimentation in sewage samples which had been treated with polyelectrolytes was essentially completed in 10 to 15 min. Overall performance of somewhat overloaded waste water treatment plants might be improved by using high velocity gradients, polyelectrolytes, and coagulant aids. (Snyder-FIRL)
W76-09179

AMMONIA REMOVAL BY USE OF CLINOPTILOLITE,
Langkaer Vaenge, Copenhagen (Denmark).
S. E. Jorgensen, O. Libor, K. L. Graber, and K. Barkacs.
Water Research, Vol. 10, No. 3, p 213-224, 1976. 12 fig, 7 tab, 12 ref.

Descriptors: *Ion exchange, *Polyelectrolytes, *Ammonium, Chemical precipitation, Pilot plants, Adsorption, Organic compounds, *Waste water treatment.
Identifiers: *Clinoptilolite, *Ammonia removal, Physico-chemical treatment.

The ion exchange process, using the ammonium selective ion exchanger clinoptilolite, was studied, including the dependence of the efficiency and capacity on pH, flow, and interval of regenerations and practical use in a combined physical-chemical method with chemical precipitation. The basic process was investigated in ammonium chloride, hydrochloric acid, and ammonia solutions, and in ion-free distilled water. Ammonia removal was studied as a function of time, volume treated, and number of regenerations. An attempt was made to reproduce the results of these laboratory experiments in pilot plant tests. Clinoptilolite works by ion exchange at low concentrations of the counter ion; adsorption increases at higher concentrations. The capacity is apparently around 8 mmol/100 g. The electrochemical properties of the counter ion are similar to those of the ammonium ion. The efficiency increases with the amount of material used up to a certain level. Increasing the contact time increases the capacity for times up to 120 min. Increasing the number of regenerations increases the capacity up to three regenerations. The other ions present inwaste water and tap water considerably reduce the ammonium-removal capacity as compared to distilled water. Five to 10/vv is a preferred flow rate. A combined method with chemical precipitation gives 90% removal efficiency of both organics and ammonium. The results can be duplicated on a pilot plant treating 100 liters/hr. (Snyder-FIRL)
W76-09180

CONDITIONING IMPROVES SLUDGE FILTERABILITY,
Water Pollution Control National Research Center, Cairo (Egypt).
F. A. El-Gohary, and M. Saleh.
Water and Sewage Works, Vol. 123, No. 3, p 72-76, March, 1976. 6 fig, 9 tab, 19 ref.

Descriptors: *Sludge treatment, *Filtration, *Activated sludge, Dewatering, Coagulation, *Waste water treatment.
Identifiers: Sludge conditioning, Ferric chloride.

Secondary sludge, consisting almost entirely of microorganisms produced during biological treatment, is usually harder to concentrate than primary sludge. Because it is economically difficult to provide the space required for sludge drying, the sludge must be treated with filtering agents and mechanical methods to accelerate drainage. The properties of excess sludge from a contact stabilization pilot plant were studied. The ability of surplus activated sludge to be dewatered by vacuum filtration was investigated with laboratory scale procedures. Ferric chloride, ferrous sulfate, calcium oxide, and Nalco '600 S' were used as coagulants. Sludge was thickened, reducing the volume by about 20%, before chemical treatment or aerobic digestion. The sludge's specific resistance tended to increase at increasing pressures. The specific resistance of surplus sludge from the stabilization zone was 2.09 times 10 to the 10th power after 18 hr aeration, 3.19 times 10 to the 10th power after 42 hr aeration, and 2.5 times 10 to the tenth power after 90 hr of aeration. When nitrogen and phosphorus salts were added to the sludge prior to aeration, increasing the aeration time improved the rate of filtration. Ferric chloride was the best coagulant for treating surplus activated sludge under the conditions studied. Coupling 100 mg/liter ferrous sulfate with 100 mg/liter calcium oxide also improved the clarification rate of the supernatant. Nalco '600' in dosages between 5 and 10 mg/liter reduced the sludge volume between 21 and 23%. (Snyder-FIRL)
W76-09181

TWO-STEP PHOSPHATE REMOVAL FROM SOLUTION USING ALUMINUM SALTS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
P. H. Hsu.
Environmental Letters, Vol. 10, No. 4, p 311-317, 1975. 2 tab, 4 ref.

Descriptors: *Chemical precipitation, *Phosphates, *Nutrient removal, *Waste water treatment, Iron, Aluminum, Lime, Salts.
Identifiers: Alum.

It is possible to precipitate phosphate from waste water using iron, aluminum, or lime, but this is seldom done. The procedure has been considered too expensive, although there is little conclusive information on costs. Both low residual phosphate concentration and large amounts of phosphate precipitated per mole of coagulant are desired, but these two criteria are not always compatible. An experiment was performed in which phosphate was precipitated from phosphate solutions of varying concentrations in a conventional one-step process. Three or 4 moles of aluminum sulfate must be added per mole of phosphate to produce a phosphate concentration below 0.1 ppm. In a second experiment, a dosage of aluminum approximately equal to the amount of phosphate present was first added; after an hour for settling, 3 times the amount of phosphate remaining in solution was added to the filtered solution. Between 1.6 and 2.0 moles of aluminum per mole of phosphate initially present were required to produce phosphate concentrations below 0.1 ppm. Both experiments were conducted with sample pH between 4.5 and 7; even better results may be obtained above pH 7. The two-step process may be useful in removing phosphate from waste water with high phosphate content. Similar results were obtained in experiments using aluminum chloride instead of aluminum sulfate, except that the sample pH had to be adjusted to above 6. (Snyder-FIRL)
W76-09182

SEWAGE TREATMENT WITH ACTIVATED FLY-ASH AND REGENERATED ALUM SLUDGE,
University Coll. of Science, Calcutta (India); and University Coll. of Technology, Calcutta (India).
M. Adhikari, S. K. Gupta, and B. Banerjee.
Journal of the Institution of Chemists (India), Vol. 47, Part 5, p 165-169, September, 1975. 1 tab, 18 ref.

Descriptors: *Sewage treatment, *Coagulation, Polyelectrolytes, Bacteria, Adsorption, Flocculation, Solids removal, *Waste water treatment.
Identifiers: *Alum sludge, *Fly ash.

The use of activated fly-ash/reclaimed alum sludge with a conventional coagulant in domestic sewage treatment was studied. Sewage water was treated with alum together with activated fly-ash, regenerated alum sludge, polyelectrolytes, or combinations of two agents; or with primary coagulant. Algae were enumerated and the presumptive coliform count was used to measure the bacterial population. Properly treated fly ash showed increased adsorption capacity and acted as a coagulating and flocculating agent. Polyelectrolytes and fly-ash showed a synergistic effect. Their use with

alum for sewage treatment improves the efficiency of operation and increases the capacity of a given plant. The process also markedly reduced phosphate content, oxygen consumed, most probable number of coliforms, and total dissolved solids in treated water. (Snyder-FIRL)
W76-09183

THE TYNESIDE SEWERAGE SCHEME,
Northumbrian Water Authority, Gosforth (England).
W. B. Norgrove, and K. D. Staples.
Journal of the Institution of Water Engineers and Scientists, Vol. 30, No. 1, p 9-34, February, 1976. 6 fig, 1 tab, 5 ref.

Descriptors: *Sewage treatment, *Treatment facilities, *Sewerage, Water pollution control, Sludge treatment, *Waste water treatment, Rivers, Estuaries.
Identifiers: Tyneside Sewerage Scheme(Great Britain).

Much of the sewage from Tyneside, Great Britain, is discharged into the River Tyne and its tributaries, without receiving any treatment. Tyneside's sewerage system is currently being improved to reduce the resulting pollution in the estuary. Interceptor sewers are being built along both sides of the river. Vortex-type overflows will be used to separate storm water, due to the super-critical flow velocities in many sewers. The treatment process will initially consist of screening, grit removal, and primary sedimentation; river water monitoring will determine what further treatment processes are necessary. Optimized design parameters for the aerated spiral flow grit tanks were determined by model analysis. They were designed with sewage entering at the surface perpendicular to the tanks with a maximum longitudinal velocity of 0.2 m/sec. The minimum retention time was 2.5 min, and the air supply was based on 0.28 cu m/min per m tank length. A surface loading figure of 36.5 cu m/sq m per day and a scour velocity of 31 mm/sec were used in designing the sedimentation tank. Sludge quantities were based on 0.07 kg/h/d for primary sludge and 0.11 kg/h/d for mixed sludge in 1975, and 0.08 kg/h/d and 0.12 kg/h/d for primary and mixed sludge, respectively in 1995. The Tyne Siphon was constructed to convey sewage from the Jarrow preliminary treatment works under the River Tyne to the Howden treatment works. (Snyder-FIRL)
W76-09184

ENERGY SAVING--AN IMPORTANT CONSIDERATION,
For primary bibliographic entry see Field 5A.
W76-09187

THE NATURE OF ACTIVATED SLUDGE FLOCS,
University Coll., Cardiff (Wales). Dept. of Microbiology.
A. E. Steiner, D. A. McLaren, and C. F. Forster.
Water Research, Vol. 10, No. 1, p 25-30, 1976. 6 fig, 3 tab, 26 ref.

Descriptors: *Activated sludge, *Flocculation, *Waste water treatment, Biological treatment, Sludge, Polymers, Chemical properties, Physical properties, Analytical techniques.

Several studies have confirmed that the settling properties of sludge depend upon the chemical and physical nature of the floc surface and that sludge volume index may be related to the surface charge carried by the sludge particles. Several experimental techniques were implemented to explain the phenomenon of bio-flocculation. These included sludge sampling, electrophoretic mobility measurements, thin layer chromatography, enzymic treatments, and general analytic methods. From this work, it appears that the activated sludge matrix is composed of at least two polymeric species both of which contribute to the negative charge carried by the sludge. This charge affects the sludge settling properties. Within the matrix occurs inter-polymer bonding by metal ions. Because further cation absorption may occur by attachment to hydroxyl units in the polymers, this is believed to be the mechanism by which heavy metal ions are removed during effluent treatment. (Kramer-FIRL)
W76-09188

CHLORINATION AND IODINATION OF POLIOVIRUS AND F2,
Maryland Dept. of Natural Resources, Annapolis.
For primary bibliographic entry see Field 5A.
W76-09196

MONITORING DISSOLVED-OXYGEN CONTENT TO ASSURE CLEAN WASTEWATER,
For primary bibliographic entry see Field 5A.
W76-09202

QUALITY CONTROL IN SEWAGE TREATMENT PLANT (GESUISHORIJO NO SHISHUTSU SEIGYO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
Y. Nagata, T. Tomita, I. Takase, and S. Yoshida.
Toshiba Rebyu, (Toshiba Review), Vol. 31, No. 1, p 23-26, January, 1976. 3 fig, 6 tab, 2 ref.

Descriptors: *Water quality control, *Sewage treatment, Treatment facilities, Instrumentation, *Activated sludge, *Mathematical models, Model studies, *Waste water treatment.

Mathematical modelling for sewage treatment processes using the activated sludge method may be discussed both theoretically and experimentally. The Toshiba firm's viewpoints concerning both systems and hardware were expressed. Water quality sensors based on field results have been evaluated. Both mathematical models and present state evaluation were used to compare instrumentation systems. (Kramer-FIRL)
W76-09205

DECISION PERSPECTIVES ON URBAN STORM WATER POLLUTION,
GKY and Associates, Alexandria, Va.
For primary bibliographic entry see Field 5G.
W76-09207

HYDRAULIC CALCULATION OF SLUDGE PIPELINES IN WASTE WATER TREATMENT PLANTS (DE HYDRAULISCHE BEREKENING VAN SLIBWATERLEIDINGEN OP RIOOLWATERZUIVERINGSTALLATIES),
For primary bibliographic entry see Field 8C.
W76-09208

PROBABILITY MODELS OF WASTEWATER TREATMENT PLANT OPERATION,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. W. Bulkley.
Journal of Hydrology, Vol. 28, No. 2/4, p 317-329, February, 1976. 2 fig, 3 tab, 4 ref.

Descriptors: *Waste water treatment, *Model studies, *Treatment facilities, *Phosphorus, *Operations, Biochemical oxygen demand, Suspended solids, Chemical precipitation, Probability.

Mathematical probability models have been used to evaluate the data from waste water treatment facilities and to compare performance data with planned design standards. Three years of daily operating data from a waste water treatment plant at Ann Arbor, Michigan, were studied. Parameters investigated were Voltaire suspended solids, biochemical oxygen demand, and total phosphorus. Statistical analyses showed that once chemical processes for phosphorus removal had been stabilized, the removal efficiencies of both volatile solids and BOD improved significantly and could be represented by normal distributions. Precipitation of phosphate through the addition of ferric chloride resulted in a noticeable improvement in subsequent BOD and suspended solids removal in the secondary treatment phase of plant operation. However, no parameter variation has been performed to find range differences which are not significant for the assumed distribution. (Kramer-FIRL)
W76-09210

DESIGN PROCEDURE FOR A CONTACT STABILIZATION ACTIVATED SLUDGE PROCESS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
L. D. Benefield, and C. W. Randall.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 147-152, January, 1976. 2 fig, 11 ref.

Descriptors: *Activated sludge, *Design criteria, *Waste water treatment, Equations, Mathematical models.
Identifiers: *Contact stabilization, Design equations.

One widely used modification of the activated sludge process is contact stabilization. The development of design equations for this process by using concepts proposed by Eckenfelder and Lawrence and McCarty is presented. The typical flow scheme for the contact stabilization activated sludge process is illustrated. The design procedure entails selection of the desired effluent substrate concentration, selection of desired solids concentration for the contact tank, selection of the desired sludge age, plotting of the variation of sludge volume index with sludge age, calculation of the expected solids concentration in the underflow from the secondary clarifier, operation of the stabilization tank at a solids concentration equal to the solids concentration of the underflow from the secondary clarifier, determination of kinetic coefficients, calculation of the hydraulic detention time in the contact tank, and substituting the proper values into a formula to obtain the required kinetic volume for the contact tank. Equations for each of these steps are provided, as well as details of how to further obtain the volume of the secondary clarifier. Although many assumptions were made to develop this design procedure, it is expected that it will provide the engineer with a design applicable for determining a desired treatment. (Kramer-FIRL)
W76-09211

RECENT TRENDS OF PROCESS CONTROL FOR WATER WORKS AND DRAINAGE (JOGESUIDO PUROSESU SEIGYO NO DOKO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
For primary bibliographic entry see Field 5G.
W76-09214

COMPUTER CONTROL OF SEWAGE AND RAIN WATER PUMPS AT SEWAGE TREATMENT PLANT (GESUISHORIJO NO OSUI, AMAMIZU PONPU NO KEISANKI SEIGYO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
For primary bibliographic entry see Field 8C.
W76-09215

UTILIZATION OF WASTEWATER SLUDGE FOR AGRICULTURAL SOIL ENRICHMENT,
East Bay Municipal Utility District, Oakland, Calif.
H. C. Hyde.
Journal Water Pollution Control Federation, Vol. 48, No. 1, p 77-90, January, 1976. 6 fig, 6 tab, 17 ref.

Descriptors: *Heavy metals, *Groundwater, *Sludge disposal, Irrigation, Crops, Waste water treatment, Data collection, Heavy metals, Nutrients, *Water reuse, Waste water disposal.
Identifiers: Land application.

Waste water sludge was studied as a source of plant nutrients. Soil, groundwater, and plant samples were collected from field corn plots, pasture, irrigated pasture, and dry land. It seems to be feasible to use waste water sludge for soil enrichment subject to proper management and regulatory requirements. The soil type, topography, and sparse population of the study location were favorable for application of sludge on land. Quality and production of crops and forage were improved by sludge application. Salinity, nutrients, and trace elements did not significantly effect the soil-plant-water ecosystem. Pathogenic organisms survived in the sludge, but restricted public access and selection of crop systems and grazing animals would minimize the risks. The final status of regulatory requirements on the system is uncertain. The importance of public attitudes requires that aesthetic characteristics and effects on land quality and public health be thoroughly understood. An important technical obstacle to the process is the unknown effects of heavy metals in the sludge on the ecosystem and, eventually, in human food. The data obtained demonstrate the difficulties involved in assessing the long-term effects that heavy metals might produce. (Snyder-FIRL)
W76-09219

HEPATITIS ATTRIBUTED TO POLLUTED STREAM,
Pierce County Health Dept., Tacoma, Wash.
For primary bibliographic entry see Field 5C.
W76-09220

STUDY ON THE BALANCE OF HEAVY METALS IN ACTIVATED SLUDGE TREATMENT PROCESS (GESUI SHORI SHISETSU NI OKERU JUKINZOKURUI NO SHUSHI NI KANSURU KENKYU),
Public Works Research Inst., Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W76-09222

EXPERIMENTAL REPORT FOR REGENERATION OF ACTIVATED CARBON AND RECALCINATION OF LIME SLUDGE (KASSEITAN, SEKKAI-ODEN NO SAISEI JIKKEN HOKOKU),
F. Hirose, T. Kataoka, and T. Kato.
Gesuido Kyokaishi, (Journal of Japan Sewage Works Association), Vol. 12, No. 139, p 26-36, December, 1975. 8 fig, 12 tab, 9 ref.

Descriptors: *Activated carbon, Lime, *Waste water treatment, Recycling.
Identifiers: *Regeneration, *Lime sludge recalcination, *Regeneration furnace.

The regeneration of activated carbon by a six stage regeneration furnace is described, and the recalcination of lime sludge by the same furnace is also considered. The regeneration furnace consisted of three processes: drying, roasting, and activation. The effects of the furnace temperature, regeneration time, and furnace atmosphere on the carbon and lime regenerations were studied. For carbon regeneration, an adsorption capability of 99 to 110% for iodine, phenol, DBS, and Tartrazine (MW 5498) could be obtained when the used carbon was regenerated at 850 C for 30 minutes with a total steam injection rate of about 30 kg/hr and a carbon input rate of 25 to 28 kg/sq m/hr. No decrease in the hardness of the carbon was observed by the regeneration treatment. The yield for the regeneration was more than 97% based on weight. The recovery efficiency of the pore characteristics was high, with a 91 to 101% recovery of both the pore surface area and the pore capacity being obtained. For lime sludge recalcination, 95% conversion from calcium carbonate to calcium oxide could be achieved at a temperature above 850 C for a recalcination time longer than 50 minutes. (Katayama-FIRL)
W76-09223

MONOGRAPH OF THE EFFECTIVENESS AND COST OF WATER TREATMENT PROCESSES FOR REMOVAL OF SPECIFIC CONTAMINANTS. VOL. 1. TECHNICAL MANUAL,
Volkert (David) and Associates, Bethesda, Md.
For primary bibliographic entry see Field 5F.
W76-09227

CAPABILITIES AND COSTS OF TECHNOLOGY ASSOCIATED WITH THE ACHIEVEMENT OF THE REQUIREMENTS AND GOALS OF THE FWPCA OF 1972 FOR PULP AND PAPER INDUSTRY.
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 5G.
W76-09229

NEW METHOD FOR REMOVING SODIUM SULFIDE FROM SLUDGE,
Environmental Science Research Lab., Nagoya (Japan).
Y. Ueno.
Svensk Papperstidning, Vol. 79, No. 2, p 62-66, February 10, 1976. 5 fig, 6 ref, 2 tab.

Descriptors: *Sludge treatment, *Chemical precipitation, Pulp wastes, Wastes, Water pollution treatment, Industrial wastes, Water pollution sources, Sludge, *Waste water treatment, Catalysts, Oxidation, Dewatering, Neutralization, Aeration, Odor, Air pollution, Sulfur compounds, Sulfides.
Identifiers: *Sodium sulfide, Hydroquinone, Iron chloride, Ammonium peroxydisulfate, Kraft mills.

Sludge from pulp mill effluent was freed of sodium sulfide, using a catalyst system of hydroquinone, ferric chloride, and/or ammonium peroxydisulfate. The pilot-plant operation involved precipitation of sodium sulfide by oxidation in suspension, sedimentation of sludge, catalyst recovery from the suspension for reuse, and neutralization plus dewatering of the sludge for disposal. In calculating air volumes needed for complete removal of sodium sulfide from experimental data, it became obvious that multiples of the theoretical air volume were about 45 (without catalyst), 15 (for hydroquinone/ferric chloride), and 10 or less (for hydroquinone/ferric chloride/ammonium persulfate). Good results were obtained while preserving the catalytic activity. The process seems well applicable to industrial sludge treatment for kraft mill odor control and similar air pollution abatement. (Brown-IPC)
W76-09278

CONTINUOUS FILTER FOR DEWATERING SLUDGES (FILTRE CONTINU DE DESHYDRATATION DES BOUES),
Papier, Carton et Cellulose, Vol. 24, No. 11, p 45, November, 1975. 1 fig, 2 illus, 1 tab.

Descriptors: *Sludge treatment, *Dewatering, *Filters, Equipment, Filtration, Water pollution sources, Pulp wastes, Wastes, Industrial wastes, Sludge, *Waste water treatment.

Twin-wire filters made by the Andritz Co. of Graz, Austria, for continuously dewatering paper mill sludges are briefly described, including the 'P' model for fibrous sludges and the 'S' model for viscous sludges such as those coming from secondary (biological) effluent treatment. (Speckhard-IPC)
W76-09279

STUDIES OF FLOCCULATION AND SEDIMENTATION TREATMENT OF PULP MILL EFFLUENTS: AN APPROACH OF A CLOSED SYSTEM USING CALCIUM ALUMINATE HYDRATES (IN JAPANESE),
Oji Paper Co. Ltd., Kasugai (Japan).
T. Horikoshi, O. Ebinuma, K. Koide, and S. Inoue.
Japan Tappi, Vol. 30, No. 1, p 40-50, January, 1976. 13 fig, 17 ref, 3 tab. English summary.

Descriptors: *Flocculation, *Sedimentation, *Pulp wastes, *Chemical precipitation, *Waste water treatment, *Hydrates, Aluminum, Calcium, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Silica, Sludge treatment, Incineration, Sulfur, Magnesium, Drainage, Water pollution control, Sludge disposal, Closed conduits, Effluents.
Identifiers: Chemical recovery, Chemical consumption, *Calcium aluminate, Aluminum-calcium hydrates, Closed systems, Spent pulping liquors.

The flocculating/settling properties of aluminum-calcium hydrates prepared by reacting aluminum chloride with calcium hydroxide at pH 11 or above were investigated on effluents from cold-soda semichemical and high-yield sulfite pulping. The aluminum-calcium treatment was found to be superior to the use of aluminum hydroxide or massive lime dosage. Sludges from the treated effluents could be incinerated above 600 C and the chemicals recovered by carbonating the first thickener effluent below pH 8.5, so that chemical consumptions (aluminum chloride and CaO) are low in the closed system. The drainage properties of the sludge were superior to those from aluminum hydroxide treatment, and comparable to those of lime-precipitated sludge. Compounds interfering with the closed-system operation include S, Mg, and silica, since S reacts with aluminum-calcium hydrates, and silica and Mg react with calcium hydroxide to form a CaO/silican dioxide/magnesium hydroxide complex. (Brown-IPC)
W76-09284

PROBLEMS CAUSED BY INDUSTRIAL RESIDUAL WATERS TREATED IN CONJUNCTION WITH URBAN WATERS (PROBLEMAS PLANTEADOS POR LAS AGUAS RESIDUALES INDUSTRIALES EN SU TRATAMIENTO CONJUNTO CON LAS AGUAS URBANAS),
J. G. Catalan Lafuente.
Investigacion y Tecnica del Papel, Vol. 12, No. 46, p 953-967, October, 1975. English summary.

Descriptors: *Waste water treatment, *Industrial wastes, *Municipal wastes, Water pollution treatment, Water pollution sources, Wastes, Waste treatment, Toxicity, Sedimentation, Biodegration, Treatment facilities, Water pollution control.
Identifiers: *Combined treatment.

Parameters usually considered when determining waste water treatment procedures are reviewed. It is suggested that when mixtures of industrial and domestic waste waters are to be treated, it is necessary to consider the composition and volume of water to be treated, and the content of toxic substances. A treatment facility should be selected based on the type of water being processed and in agreement with the sedimentation and biodegradation rates of the substances present in the water. (Sykes-IPC)
W76-09285

FILTER MEDIA COMPARISON AT PRINCE GEORGE PULP AND PAPER (LIMITED),
Prince George Pulp and Paper Ltd. (British Columbia).
C. E. Stapley, and J. McDonald.
Canadian Pulp and Paper Association Transactions Technical Section, Vol. 1, No. 4, p 107-112, December, 1975. 14 fig, 11 ref, 8 tab.

Descriptors: *Pulp wastes, *Filters, *Suspended solids, Water pollution sources, Wastes, Industrial

wastes, Bleaching wastes, Chemical precipitation, Lignins, Salts, Neutralization, Biochemical oxygen demand, Color, Filtration, *Waste water treatment, Water pollution treatment, Calcium compounds, Monitoring, Particle size, Effluents.
Identifiers: Glass fibers, Filter paper, Kraft mills, Molecular weight.

Comparative performances of glass fiber vs. paper filters in monitoring kraft mill suspended solids of aqueous effluents are discussed. Increased suspended solids contents were encountered with the glass fiber filter, caused by precipitation of calcium lignate during neutralization of bleachery wastes. The lignin-calcium complex was characterized for settleability, 5-day BOD, color absorption, and molecular size. Possibilities of preventing its formation are discussed. (Brown-IPC)
W76-09286

SUSPENDED SOLIDS REMOVAL FROM WOODROOM EFFLUENT,
Consolidated-Bathurst Ltd., Montreal (Quebec).
Y. M. Mehta, Y. Lemay, and G. Menier.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 1-8. 7 fig, 5 tab.

Descriptors: *Suspended solids, *Wood wastes, *Waste water treatment, Wastes, Industrial wastes, Centrifugation, Screens, Flotation, Water pollution treatment, Water purification, Pilot plants, Operation and maintenance, Bark, Waste treatment, Water pollution sources, Effluents, Water pollution control, Equipment.
Identifiers: Lamella thickener, Hydrocyclonic Rotostrainer, Vorject cleaner, Sedifloat, Woodroom effluents, Krofta Engineering Corporation.

The performance of centrifugal cleaners (Vorject cleaners of different sizes), a rotary slotted screen (Hydrocyclonic Rotostrainer), an inclined-plate thickener (Lamella Thickener), and dissolved air flotation equipment (Sedifloat from Krofta Engineering Corporation) in reducing the suspended solids losses from woodroom effluent were evaluated in pilot plant trials conducted mainly at the Laurentide and Port Alfred Division mills of Consolidated-Bathurst Ltd. This report describes the results obtained and operating problems encountered during these studies, with emphasis on the trials with the flotation unit and inclined-plate sedimentation clarifier. The findings showed that both the Lamella Thickener and air flotation device were satisfactory for removing bark fines from woodroom effluent. The centrifugal cleaners and the rotary screen were ineffective for fines having a particle size less than 100-mesh. (Witt-IPC)
W76-09289

ECONOMIC CONSIDERATIONS IN THE SELECTION OF A BIOLOGICAL TREATMENT SYSTEM,
J. E. G. Sikes, and G. A. Nieminen.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 9-16. 3 fig, 19 ref, 5 tab.

Descriptors: *Biological treatment, *Pulp wastes, *Waste water treatment, *Economics, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Aerated lagoons, Activated sludge, Operating costs, Costs, Nutrients, Sludge, Toxicity.
Identifiers: *Kraft mills.

Cost comparisons of a short- and long-detention aerated lagoon for a typical 800 ton/day bleached kraft mill indicate minimal differences in overall annual costs between the two lagoons, providing suitable land is available. Similar comparisons for a high- and low-rate conventional activated sludge plant suggest that the operating cost reductions associated with the larger plant may outweigh the additional initial investment. The major reasons for reduced operating costs for low-rate biological treatment plants are lower nutrient requirements and, in the case of an activated sludge system, less excess biological sludge. Other benefits of larger plants are better toxicity reduction, lower sensitivity to raw effluent load fluctuations, and compatibility with future mill expansion or more stringent regulatory requirements. (Witt-IPC)
W76-09290

DESIGN CONSIDERATIONS OF FOAM SEPARATION PROCESS FOR DETOXIFICATION OF KRAFT EFFLUENTS,
B. C. Research Ltd., Vancouver.
K. S. Ng, and P. Temoin.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P. Q.), p 27-32. 1 fig, 1 illus, 9 ref, 9 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Foam separation, *Aeration, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Toxicity, Water pollution treatment, Bubbles, Capital costs, Operating costs, Costs, Mixing, Water quality control, Separation techniques.
Identifiers: *Kraft mills, Skum Slaker.

Foam separation effectively detoxifies bleached kraft whole mill effluent. A jet aeration system is recommended for foam generation. It produces bubbles of less than 1 mm diameter, provides 30 sq m/liter/hr of gas-liquid interfacial area (bubble surface), permits long contact time, and provides complete mixing. A turbine centrifugal type foam breaker (Skum Slaker) is recommended for foam breaking. This system exerts a positive driving force and draws the stagnant foam to the rapidly rotating blades. The capital cost of equipment for a foam separation plant detoxifying 25 million gal/day of effluent from a 750 ton/day mill is estimated to be $1,781,000. Operating costs including foam breaking and foam treatment is estimated to be $2.10/ton of pulp or 6.3 cents/1000 gal. This cost is comparable to aerated lagoon systems and is less than high rate biological systems. (Witt-IPC)
W76-09292

CHEMICAL CHARACTERISTICS, ACUTE TOXICITY AND DETOXIFICATION OF FOAM IN TWO AERATED LAGOONS,
International Pacific Salmon Fisheries Commission, Cultus Lake (British Columbia). Sweltzer Creek Salmon Research Lab.
For primary bibliographic entry see Field 5C.
W76-09295

SECONDARY EFFLUENT TREATMENT AT NORTHWOOD PULP AND TIMBER LIMITED,
Northwood Pulp and Timber Ltd., Prince George (British Columbia).
J. E. Nylund.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 65-68. 3 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Sewage treatment, *Treatment facilities, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Biological treatment, Activated sludge, Aeration, Hydrogen ion concentration, Nutrients, Water purification, Biochemical oxygen demand, Suspended solids, Aerated lagoons, Operation and maintenance, Costs, Temperature, Toxicity.

Improvements in Northwood Pulp and Timber Ltd. effluent treatment facilities over the past 9 years are outlined. The out-plant treatment facilities at the mill startup in 1966 consisted of biological treatment of only the contaminated mill sewers using an extended activated sludge treatment plant. In 1968, to handle the higher loadings from the mill, improvements were made, such as addition of floating aerators, dredging of the biobasin, better pH control, and installation of a batch makeup system for shift addition of nutrients. A 220-ft-diameter primary clarifier was installed in 1971 to eliminate the problem of solids deposition in the biobasin and to ensure that the general sewer water was treated for BOD as well as for solids. Finally, a 5-day aerated stabilization basin was installed in the secondary treatment system in late 1974. During 5 months operation of the aerated stabilization basin, it was found that BOD loadings to the receiving water have decreased approximately 20 lb/air-dry ton, problems with effluent toxicity have been eliminated, nutrient costs have decreased by 50%, and having two biological systems in service has allowed BOD polishing in the extended activated sludge plant. Although there have been great benefits from the aerated stabilization basin, the suspended solids loadings from the treatment system have not been in complete compliance with the solids requirement of 15 lb/air-dry ton, and the stabilization basin's ability to destroy BOD appears to depend on effluent temperature. (Witt-IPC)
W76-09297

DETOXIFICATION AND DECOLORIZATION OF KRAFT PULP MILL EFFLUENTS USING ACTIVATED CARBON,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, T. Tenn, J. Dorica, and S. Prahacs.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 69-75. 6 fig, 35 ref, 4 tab.

Descriptors: *Pulp wastes, *Activated carbon, *Color, *Toxicity, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution control, Aeration, Water purification, Biochemical oxygen demand, Carbon, Air, Polyelectrolytes, Capital costs, Operating costs, Costs, Effluents.
Identifiers: *Kraft mills, Aluminum sulfate.

A method developed by the Pulp and Paper Research Institute of Canada for detoxifying bleached kraft mill effluent involves addition of powdered activated carbon to the effluent, aeration for 20-30 minutes, addition of settling aids (alum and polyelectrolyte), and clarification by conventional means. Simultaneously, 70-85% of the color and 20-40% of the BOD are also removed. Recent mill-site tests of the process showed that the optimum dosages of carbon, air, alum, and polyelectrolyte for detoxification and decolorization of combined kraft mill effluents are 200 mg/liter, 14 liters/liter, 300 mg/liter, and 1 mg/liter, respectively. The treatment of effluents from a 455 ton/day kraft mill is estimated to require a capital investment of $2-3 million and an operating cost of about $6/ton of pulp. (Witt-IPC)
W76-09298

SECONDARY TREATMENT AT ONTARIO-MINNESOTA PULP AND PAPER COMPANY LIMITED, FORT FRANCES, ONTARIO,
Ontario-Minnesota Pulp and Paper Co. Ltd., Fort Frances (Ontario).
S. C. Mosher.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 93-97. 2 fig, 5 ref, 5 tab.

Descriptors: *Pulp wastes, *Treatment facilities, *Waste water treatment, Sewage treatment, Aerated lagoons, Settling basins, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Bark, Operation and maintenance, Operating costs, Costs, Water pollution control.
Identifiers: Kraft mills, Groundwood mills.

The Fort Frances mill is an integrated pulp and paper complex consisting of a 500 ton/day paper mill, a 500 ton/day groundwood mill with its associated wetbarking facility, and a 500 ton/day bleached kraft mill and associated dry barking operation. A secondary treatment system has been in operation since late 1971 when an aeration lagoon and two settling basins went onstream in conjunction with the kraft mill startup. Performance data for this system are reviewed, and operating problems and their solutions are outlined. Operating costs for 1974 totaled $251,000, including $130,000 for pond cleaning ($60,000 for labor and $70,000 for equipment rental), $71,000 for nutrients, and $50,000 for power (aerators, lighting, and pumps). (Witt-IPC)
W76-09301

STUDIES ON OXYGEN-ALKALI TREATMENT OF LIGNEOUS MATERIALS. PART V. RECYCLE AND REUSE OF WASTE LIQUOR IN O-PA-P BLEACHING SEQUENCE (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Wood Chemistry Lab.
For primary bibliographic entry see Field 3E.
W76-09337

SEPARATION PROCESSES USED FOR POLLUTION CONTROL IN THE PULP AND PAPER INDUSTRY,
Foundation of Canada Engineering Corp. Ltd., Halifax (Nova Scotia).
R. H. Fletcher, and M. Schwartz.
American Institute of Chemical Engineers (A.I.Ch.E.) Symposium Series, Vol. 70, No. 136, p 693-712, 1974. 13 fig, 14 ref, 1 tab.

Descriptors: *Water pollution control, *Pulp and paper industry, *Separation techniques, Color, Odor, Toxicity, *Waste water treatment, Water pollution sources, Wastes, *Industrial wastes, Waste treatment, Pulp wastes, *Biological treatment, Aerated lagoons, Biochemical oxygen demand, Water pollution treatment, Effluents, Dispersion.
Identifiers: Boat Harbor(Nova Scotia), Kraft mills.

Water separation techniques for pollution control in the pulp and paper industry are reviewed. Impending shortages of petroleum products and rising costs of oil make wood-derived products more attractive. Waste separation processes are discussed, including color removal from bleached kraft mill waste water, odor and toxicity removal, and condensate stripping. Liquid-solids separation and biochemical treatment, and dispersal of effluents are also considered. A case history of the Boat Harbor, Nova Scotia, biological treatment facilities for kraft mill wastes is presented. The six-day retention aerated lagoon was based on the following criteria; flow measurements, 5-day BOD analysis, settling column tests for primary sedimentation, and allowance for future expansion. (Sykes-IPC)
W76-09340

PAPETERIES DE L'AA -- SUSPENDED SOLIDS REDUCED BY 98%, ORGANIC MATERIALS BY 74% (PAPETERIES DE 1'AA -- MES REDUITES DE 98%, ET MO DE 74%),
M. Vandewoestyne, and K. Maric.
Papier, Carton et Cellulose, Vol. 24, No. 11, p 70-73, November, 1975. 3 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Water reuse, Foreign countries, Hydrogen ion concentration, Flocculation, Sludge treatment, Dewatering, Wastes, Waste treatment, Industrial wastes, Water pollution sources, Water pollution treatment, Filtration, Recycling, Chemical precipitation, Water purification, Sludge, *Organic matter, *Suspended solids.
Identifiers: *France, White water(Paper machine), Aluminum sulfate.

Efforts to reduce pollution at a French paper mill and coating plant are reviewed, including the recycling of the paper machine primary and secondary water circuits and the development of physicochemical treatment for the mill effluent. The physicochemical treatment includes acidification of the coating mill effluent, mixture of this effluent with the paper machine effluent, chemical flocculation using alum, final pH adjustment, and sludge dewatering via filtration. Possibilities for recycling the clarified effluent and for reusing the dewatered sludge are being studied. (Speckhard-IPC)
W76-09341

KINETICS AND CONTROL TESTS OF NITRIFICATION-DENITRICATION PROCESS, PART I: KINETICS,
Rensselaer Polytechnic Inst., Troy, N. Y.
L. K. Wang, M. H. Wang, C. P. C. Poon, and J. Bergenthal.
In: Proceedings of the 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April 26-28, 1976, Philadelphia, Pennsylvania, p 496-500. 18 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Nitrification, *Denitrification, *Kinetics, Mathematical models, Biochemistry, Nitrogen compounds.
Identifiers: Nitrogeneous oxygen demand.

Organic nitrogen, ammonia nitrogen, nitrite nitrogen and nitrate nitrogen add to total oxygen demand by contributing a nitrogeneous oxygen demand (NOD). Since 1970, it has been recognized that this nitrogeneous oxygen demand is a potential load of stream pollution as well as the carbonaceous BOD. Activated sludge systems are now being designed that incorporate nitrification and denitrification into the overall treatment. General kinetic equations for nitrification and denitrification are presented. Important process design criteria are reviewed and discussed. Various activated sludge configurations include a three-stage biological system, a single stage unit in which sufficient time is allowed for the development of the nitrifying organisms, or a plug-flow aerobic-anoxic aeration unit. The equations presented can be considered to be mathematical models of nitrification-denitrification kinetics and chemistry. (See also W76-09366) (Orr-FIRL)
W76-09365

KINETICS AND CONTROL TESTS OF NITRIFICATION-DENITRIFICATION PROCESS, PART II: RESPIRATION AND CONTROL TESTS,
New York State Dept. of Environmental Conservation, Albany.
C. Beer, L. K. Wang, and J. Bergenthal.
In: Proceedings of the 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April 26-28, 1976, Philadelphia, Pennsylvania, p 501-508. 12 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Nitrification, *Denitrification, Mathematical models, *Kinetics, *Respiration, Oxygen uptake rate, Analytical techniques, Control schemes.
Identifiers: Nitrifying ability, Denitrifying ability.

The kinetics and chemistry relating to oxygen respiration, substrate nitrate respiration, endogenous oxygen respiration, and endogenous nitrate respiration are discussed. Equations are presented for the following reactions: biological oxidation in the carbon oxidation unit; oxygen respiration in the carbon oxidation unit for glucose and for sewage; biological oxidation in the nitrification unit; oxygen respiration in the nitrification unit for sewage; the overall energy reaction in denitrification; substrate nitrate respiration for glucose and for sewage; endogenous oxygen respiration; and, endogenous nitrate respiration. The bacterial mass of a single-stage activated sludge system which incorporates carbonaceous BOD removal and nitrification-denitrification consists of three types of organisms: facultative anaerobes which perform nitrate respiration; aerobic bacteria which cannot perform nitrate respiration, and nitrifiers, nitrosomas and nitrobacter, which are capable of oxidizing ammoniacal compounds into nitrates. For plant control purposes, it is useful to obtain an estimate of the mass of nitrifying organisms and of the mass of facultative anaerobes present in the activated sludge, and to obtain a measure of their performance under uninhibited standardized conditions. The methodology for tests of nitrifying ability, denitrifying ability, and oxygen uptake rate are presented. (See also W76-09365) (Orr-FIRL)
W76-09366

AGRONOMIC AND CATTLE STUDIES WITH MUNICIPAL LIQUID DIGESTED SLUDGE,
Agricultural Research Center, Jay, Fla.
For primary bibliographic entry see Field 5E.
W76-09367

5E. Ultimate Disposal Of Wastes

RATIONALE FOR A WATER POLLUTION CODE PART 1: THE WASTE SYSTEM AND THE NATURAL SYSTEM,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W76-08839

WASTE-HEAT DISPOSAL FROM STEAM ELECTRIC PLANTS WITH REFERENCE TO THE STOCHASTIC NATURE OF SOME ENVIRONMENTAL CONDITIONS AND TO THERMAL POLLUTION CONTROL REGULATIONS,
Energoprojekt, Belgrade, (Yugoslavia).
For primary bibliographic entry see Field 5G.
W76-08865

TREATMENT AND DISPOSAL OF WASTE FLUIDS FROM ONSHORE DRILLING SITES,
Wilson Mud Service, Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5D.
W76-08910

THE TOXICITY OF DRILLING FLUIDS, THEIR TESTING AND DISPOSAL,
Alberta Energy Resources Conservation Board, Edmonton.
For primary bibliographic entry see Field 5D.
W76-08911

THE HANDLING AND TREATING OF WATER-BASED DRILLING MUDS,
Sun Oil Co., Richardson, Tex. Production Service Lab.
For primary bibliographic entry see Field 5D.
W76-08912

WASTE WATER BASE DRILLING FLUID DISPOSAL,
Dresser Industries, Inc., Houston, Tex. Oilfield Products Div.
For primary bibliographic entry see Field 5D.
W76-08914

DISPOSAL OF DRILLING FLUIDS AND DRILLED-UP SOLIDS IN OFFSHORE DRILLING OPERATIONS,
Texas A and M Univ., College Station. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 5D.
W76-08915

REGULATION OF ONSHORE AND OFFSHORE OIL FIELD WASTE DISPOSAL,
Texas Railroad Commission, Austin, Tex.
J. E. Smith.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 579-584.

Descriptors: *Waste disposal, *Oil wastes, State governments, *Texas, Regulation, Standards.

The Texas Railroad Commission, an agency of the State of Texas, has the responsibility for the regulation of waste disposal on both state lands and state waters. This includes waste disposal from oil and gas operations. The exercise of these responsibilities is made under general statutory authority, statewide rules, or special orders. (See also W76-08889) (Heiss-NWWA)
W76-08919

UP-FLOW SEPARATOR,
For primary bibliographic entry see Field 5D.
W76-08983

PROCESS FOR TREATING SEWAGE SLUDGE AND FERTILIZER PRODUCTS THEREOF,
Orgonics, Inc., Slatersville, R.I. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08984

FLUIDIZED FURNACE CONSTRUCTION FOR BURNING PARTLY DEHYDRATED SLUDGE,
Rheinstrahl A. G., Essen (West Germany). (Assignee).
E. Albrecht.
United States Patent 3,939,782. Issued February 24, 1976. Official Gazette of the United States Patent Office, Vol. 943, No. 4, p 1631, February, 1976. 1 fig.

Descriptors: *Waste water treatment, *Sludge disposal, *Incineration, *Patents, Design, Equipment, Ultimate disposal.
Identifiers: Fluidized bed furnace, Dehydrated sludge.

A new configuration for a fluidized bed furnace to incinerate partially dehydrated sludge has been patented. The furnace housing has a bottom which forms a fluidized bed support, side walls which define a combustion chamber above the fluidized bed, an inlet for sludge through one side wall, and a discharge for the sludge on the opposite side wall. The housing bottom consists of numerous step portions arranged at distinct elevations in descending order from the inlet to the discharge. Means are also provided for directing air upwardly through the step portions to maintain the vertical operation of the bed and to support combustion in the combustion chamber. (Orr-FIRL)
W76-08988

METHOD AND APPARATUS FOR TREATING A CONTINUOUS FLOW OF FLUID WASTE PRODUCTS AND OTHER MATERIALS,
Adrian Construction Co., Dayton, Ohio. (Assignee).
For primary bibliographic entry see Field 5D.
W76-08993

WASTEWATER RECYCLING UTILIZES PESKY NUTRIENTS,
For primary bibliographic entry see Field 5D.
W76-09010

SLUDGE HANDLING AND DISPOSAL: A SPECIAL REPORT,
For primary bibliographic entry see Field 5D.
W76-09012

ADVANCED WASTE TREATMENT PLANT FEATURES NITRIFICATION,
Camp, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W76-09020

STUDIES OF HIGH-RATE BIOLOGICAL TREATMENT OF IPSWICH SEWAGE ON PILOT FILTERS USING PLASTICS MEDIA,
For primary bibliographic entry see Field 5D.
W76-09029

WATER PLANT WASTE TREATMENT: STATE OF THE ART, PART II,
Metcalf and Eddy, Inc., New York.
For primary bibliographic entry see Field 5D.
W76-09045

SEPARATION BY SOLVENT EXTRACTION,
Energy Research and Development Administration, Washington, D. C. (Assignee).
For primary bibliographic entry see Field 5D.
W76-09061

TREATING SEWAGE AS A RESOURCE REVIVES INTEREST IN LAND DISPOSAL.
Engineering News-Record, Vol. 196, No. 14, p 22-23, April 1, 1976.

Descriptors: *Sewage treatment, *Land treatment, *Water reuse, Crops, Toxicity, Municipal wastes, Waste disposal, Waste water disposal.
Identifiers: Land application.

Numerous obstacles have been encountered by recently proposed land treatment systems for municipal wastes. Both consulting engineers and the Environmental Protection Agency have contributed to this situation, although the EPA requires that cities consider the method. The advantages of land disposal systems include returning plant nutrients to the land and reuse of water as a resource. Its disadvantages include possible toxic effects of heavy metals in the effluent and the large land areas involved. Land treatment is extremely dependent on land availability and local conditions. Some predict increasing viability for land treatment due to the high costs of other treatment methods. It is believed that land treatment has a particularly good future in small towns, whose smaller operations will cause smaller public acceptability problems. Land treatment is predicted to be popular in suburban regions with the realization that it not only treats sewage but also encourages the growth of crops and provides for open spaces. (Snyder-FIRL)
W76-09151

ANAEROBIC DIGESTION OF SOLID WASTE AND SEWAGE SLUDGE INTO METHANE,
Environmental Protection Agency, Washington, D. C. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5D.
W76-09153

NUTRIENT MASS BALANCE IN COLUMNS REPRESENTING FILL SYSTEMS FOR DISPOSAL OF SEPTIC TANK EFFLUENTS,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
F. R. Magdoff, and D. R. Keeney.
Environmental Letters, Vol. 10, No. 4, p 285-294, 1975. 3 fig, 3 tab, 11 ref.

Descriptors: *Nutrient removal, *Waste water disposal, *Septic tanks, *Nitrogen, *Phosphorus, *Carbon, Septic tanks, Pollutant identification.

The distribution of carbon, nitrogen, and phosphorus was investigated in a simulated fill system for disposal of septic tank effluent. The fill system's vertical dimensions were represented in soil columns, which were dosed with septic tank effluent. After prolonged leaching, analysis revealed that carbon and nitrogen accumulated mainly in and just below the crust on top of the 60 cm sand layer. Carbon and nitrogen were sufficiently depleted from the 30 cm layer and silt loam just above the lowest layer to produce a net carbon and nitrogen loss from the soil. The columns removed approximately 22% of the influent nitrogen and almost all of the chemical oxygen demand. Influent carbon was removed by microbial respiration. Adsorption, precipitation, or a combination of the two removed phosphorus from the liquid phase; the phosphorus lost was recovered by analysis of the column soil materials. (Snyder-FIRL)
W76-09164

REGINA TERTIARY TREATMENT PLANT STUDY AND DESIGN, PART I, CASE HISTORY,
For primary bibliographic entry see Field 5D.
W76-09178

DISCHARGE OF TREATED WASTE WATER IN LAKES (DIE EINLEITUNG VON GEREINIGTEM ABWASSER IN SEEN),
For primary bibliographic entry see Field 5B.
W76-09216

PERSISTENCE OF FECAL COLIFORM INDICATOR BACTERIA ON ALFALFA IRRIGATED WITH MUNICIPAL SEWAGE LAGOON EFFLUENT,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 5C.
W76-09217

SUBSURFACE BRINE DISPOSAL - BE REASONABLE,
Engineering Enterprises, Inc., Norman, Okla.
For primary bibliographic entry see Field 5B.
W76-09261

NEW METHOD FOR REMOVING SODIUM SULFIDE FROM SLUDGE,
Environmental Science Research Lab., Nagoya (Japan).
For primary bibliographic entry see Field 5D.
W76-09278

OPTIONS FOR THE USE AND DISPOSAL OF BARK,
Neill and Gunter Ltd., Fredericton (New Brunswick).
R. D. Neill.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 99-106. 4 fig, 9 ref, 3 tab.

Descriptors: *Bark, *Waste disposal, *Canada, *Wood wastes, Disposal, Water pollution sources, Wastes, Industrial wastes, Foreign countries, Fuels, Mulching, Soil amendments, Solid wastes, Legislation, Ultimate disposal.
Identifiers: Charcoal.

Present uses and methods of bark disposal in Canada are reviewed, and environmental regulations and codes affecting its use are compared. The wood-processing industry presently disposes of 16 million tons of bark and wood waste annually. It is concluded that most bark must eventually be used as fuel. Potential profitable uses also exist for this raw material resource in producing agricultural mulch and soil additives, charcoal, and manufactured products. (Witt-IPC)
W76-09302

HISTORIC HEAT CURVE OF RECOVERY OPERATIONS,
B. Werenskiold.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings (Montreal, P.Q.), p 107-110. 1 fig.

Descriptors: *Incineration, *Fuels, *Pulp wastes, Water pollution sources, Wastes, Industrial wastes, Gases.
Identifiers: *Heat recovery, Chemical recovery.

The historic heat curve of spent pulping liquor recovery operations illustrates the gradual progress in utilizing thermal values when processing dissolved wood solids and spent chemicals. This assessment covers the past century, and includes the conversion of initially high thermal demands of 15-30 million Btu's/air-dry ton (brownstock) into net surpluses of 12-13.5 million Btu's/air-dry ton for northern conifers. Other major advances are also plotted, including more significant environmental protection measures such as stripping and flame destruction of odorous tail gases and spill retention. (Sykes-IPC)
W76-09303

OCEAN DUMPING--A RATIONAL APPROACH TO AN INTERNATIONAL PROBLEM,
Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-09304

REPORT ON THE HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE SPOIL DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
F. G. Oertel.
Available from the National Technical Information Service, Springfield, Va. 22161 as AD-A010 411 $5.50 in paper copy, $2.25 in microfiche. Final Report to the Savannah District of the Corps of Engineers, July 1974. 111 p, 36 fig, 5 tab, 9 ref.

Descriptors: *Continental Shelf, *Environmental effects, Water pollution effects Dredging, *Spoil banks, Coastal engineering, Waves(Water), Currents(Water), Winds, Storms, Ocean currents, Tidal effects, Sedimentation, Sediment transport, Sediment distribution, Settling velocity, Suspended solids, Particle size, *Georgia.
Identifiers: *Offshore spoil disposal, Siting, Underwater topography, *Savannah River(GA), Outer Continental Shelf, Offshore technology, Environmental impact.

Before selection of a site of an ocean spoil area, considerations should be given to such parameters as, proximity to an inlet, depth of water, velocity of tidal currents, velocity of coastal currents, wave character, grain size and grain settling characteristics. The Savannah River disposal area is located just within the influence of the suspended-sediment plume of the Savannah River. In this area, near-bottom tidal currents (from the inlet jet) have weakened to velocities below the threshold velocity of most of the sediment in the spoil. Major storm activity along the southeast coast is generally out of the northeast and these storms are capable of moving large ridges and mounds of spoil in a southerly direction. Thus the semistable spoil becomes active during large storms. During deposition of spoil, coarse material is accumulated in an area directly below the disposal path of the dredge. Fine-grained spoil may be dispersed a mile or more away from the disposal path of the dredge. The stability of the sediment in the disposal area is closely related to water depth and physical energy. The upper portions of the disposal mound are most susceptible to change because of their proximity to wave surge and surface currents. The combination of wave surge and surface currents during storms appears to have the greatest effect upon the movement of the mound. Biologic activity was directly related to grain size and water depth. (Sinha - OEIS)
W76-09309

WATER POLLUTION ASPECTS FROM WASTE DRILLING MUD DISPOSAL IN CANADA'S ARCTIC,
Environmental Protection Service, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W76-09334

APPLICATION OF GROUND-WATER FLOW THEORY TO A SUBSURFACE OIL SPILL,
Geological Survey, Menlo Park, Calif. Engineering Geology Branch.
For primary bibliographic entry see Field 2L.
W76-09350

AGRONOMIC AND CATTLE STUDIES WITH MUNICIPAL LIQUID DIGESTED SLUDGE,
Agricultural Research Center, Jay, Fla.
M. C. Lutrick, and J. E. Bertrand.
In: Proceedings of the 22nd Annual Technical Meeting of the Institute of Environmental Sciences, April 26-28, 1976, Philadelphia, Pennsylvania, p 528-532. 1 fig, 7 tab, 8 ref.

Descriptors: *Waste water treatment, *Sludge disposal, Agriculture, Agronomy, Crops, Cattle, Ultimate disposal, Crop response, *Heavy metals, Crop production, Fertilization, Fertilizers.
Identifiers: *Land application, Liquid digested sludge.

Studies were conducted during 1975 to determine the crop responses, nutrient uptake and heavy metal accumulation on land treated with liquid digested sludge (LDS) and to evaluate the effects of feeding dried LDS to steers in terms of performance data, accumulation of heavy metals, microorganisms, and pesticides in the animal tissues. Corn, grain sorghum, and soybeans were grown on plots receiving 0, 7.5, 15.0, and 22.5 cm of LDS applied on an annual basis. The plots receiving no LDS were fertilized with a commercial preparation while LDS treated plots were not treated with a commercial fertilizer. Three experimental Holstein steers were fed a high roughage ration, containing 100 g of sun-dried LDS, for 219 days, while control animals were fed a high roughage diet containing no LDS. Yields from all three crops were reduced due to excessive rainfall. Soybean yields were higher from all levels of LDS application than from the commercial fertilizer treatment. The corn yield from commercial fertilizer treatment was higher than any of the LDS treatments. The higher applications of LDS produced greater sorghum yields than the commercial fertilizer although the lowest LDS application produced less yield. The lead content in the kidney tissue of the LDS fed steers was higher than that in the control animals. The content of Al, Cu, Fe, Mg, Ni, and Zn was lower in the liver of the LDS fed steers than in the control steers. Fecal coliform die-off tests performed by applying 5 cm of LDS to the soil surface with check, wet, dry, and incorporated techniques showed that about four months were required for complete die-off. (Orr-FIRL)
W76-09367

NEW YORK ALTERNATIVE DUMPSITE ASSESSMENT - RECONNAISSANCE STUDY OF SURFICIAL SEDIMENTS,
National Oceanic and Atmospheric Administration, New York. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5G.
W76-09383

5F. Water Treatment and Quality Alteration

OZONIZATION OF WATER IN MOSCOW (OZONISATION DE L'EAU A MOSCOU),
I. Tverskoi.
La Nouvelle Presse Medicale, Vol. 5, No. 2, p 61-62, 1976.

Descriptors: *Potable water, *Ozone, *Disinfection, *Water treatment, Foreign research, Organoleptic properties, Color, *Treatment facilities.
Identifiers: *Moscow(USSR).

A new drinking-water ozonization plant with a daily capacity of 1,200,000 cu m of water is being installed in Moscow by the French company Trailygaz. Ozonization is performed in two steps. First in a bath, ozone is admitted through porous ceramic tubes at a rate of 3 mg/liter of water for decolorization and the improvement of organoleptic properties. A second step follows conventional purification and filtration. This second step, operating at an ozone expenditure of one mg/liter, is used for disinfection. (Takacs-FIRL)
W76-08997

LAMELLA SETTLING TANKS (LAMELLA-ABSETZBECKEN),
P. Colomb.
Gas-Wasser-Abwasser, Vol. 56, No. 1, p 43-46, 1976. 3 fig, 1 tab, 4 ref.

Descriptors: *Sedimentation, *Waste water treatment, *Water treatment, *Settling basins, Separation techniques, Equipment, Potable water, Industrial wastes.
Identifiers: *Lamella settling tanks, Chemical treatment.

General theory of sedimentation, and the uses and advantages of lamellar decanters in drinking-water preparation and waste water treatment are described. Lamellar decanters have the advantage of having a large decanting surface in a limited space. They can operate at loads of up to 2.3 m/hour against 2.3 m/hour for conventional settling basins in drinking-water preparation. They can be used with or without flocculation. For waste water treatment, they are used as a final step, operating at a load of about 15 m/hour relative to the free water surface. In case of coprecipitation, the flocculant is added after primary treatment for sludge separation in the lamellar decanter. The rates of BOD5 and phosphorus elimination are 70% and 90%, respectively. In case of precipitation after biological purification, the rate of elimination amounts to 90% for both BOD5 and phosphorus. Chemical treatment is necessary for efficient phosphorus elimination. Lamellar decanters are highly efficient in the separation and recovery of useful materials from industrial wastewaters, including those from the pulp and paper industry, metal pickling, foundries, and metallurgical plants. (Takacs-FIRL)
W76-09003

APPLICATION OF CENTRIFUGES. DEWATERING OF SLUDGES FROM WATERWORKS (APPLICAZIONE DI CENTRIFUGHE. DISIDRATAZIONE DI FANGHI PROVENIENTI DAI IMPIANTI DI POTABILIZZAZIONE),
M. Scorsa.
Inquinamento, Vol. 17, No. 11, p 49-51, November, 1975.

Descriptors: *Sludge treatment, *Dewatering, *Centrifugation, Equipment, *Polyelectrolytes, *Suspended solids, *Water treatment, Treatment facilities.
Identifiers: Centrifuges.

Sludges which accumulate at the bottom of sludge thickeners can be dewatered in centrifuges. The solids must be able to sediment while being centrifuged, and the sedimented solids must be transportable on a discharge cone located at the end of the centrifuge drum. Such conditions are achieved by injecting a polyelectrolyte solution at certain points outside and inside the centrifuge. Turbid waters containing 0.5 to 5% suspended solids can be centrifuged. A Sharples P. 3400 SDC centrifuge is capable of handling a production of 45,000 cu m/day of sludge, by working 24 hours a day and assuming that the sludge contains about 1.5% solids. The centrifuge takes up only 2.5 by 2 meters and weighs less than 2 tons. Results vary from installation to installation, but loads remain between 5 to 8 cu m/hour, with a product containing 15 to 30% dry solids and 2 to 5 kg of polyelectrolytes per ton. In all cases, over 95% of solids is recovered. (Waltner-FIRL)
W76-09008

MODERN FILTER PRESS TECHNOLOGY FOR SEWAGE SLUDGE DEWATERING,
Edwards and Jones Ltd., Stoke-on-Trent (England).
For primary bibliographic entry see Field 5D.
W76-09021

INSTRUMENTATION AND CONTROL FOR WATER WORKS (SUIDOSETSUBI NO KEISOKU TO SEIGYO),
Yokosuka Waterworks Bureau (Japan).
I. Omata, K. Hiroi, and K. Kawabe.
Toshiba Rebyu, (Toshiba Review), Vol. 30, No. 11, p 809-812, October, 1975. 7 fig.

Descriptors: *Water works, *Water treatment, *Instrumentation, Equipment, Computers, Monitoring, *Control systems.
Identifiers: Japan.

The more modern water service systems in Japan have tendencies towards increases in scale, elimination of manpower, and more economical service. Scales of water works are being enlarged through the introduction of new monitoring instruments, telemeters, and process computers, both for intake and for distribution. Instrument control equipment has significantly increased in importance. A description is presented of the remote supervision system supplied by Toshiba to the Yokosuka Waterworks Bureau, as well as new techniques for monitoring and control of waterworks. (Kramer-FIRL)
W76-09024

CHLORINATED RESIN INTENDED FOR WATER TREATMENT,
D. P. Horning, and R. E. Robertson.
U.S. Patent No. 3,948,853, 5 p, 5 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 341, April 6, 1976.

Descriptors: *Water treatment, *Patents, *Water purification, Water quality control, *Water pollution treatment, Water pollution control, Chemical reactions, *Resins, *Chlorination, *Oxidation, Water supply.

The effect of self-oxidation is evident when chlorinated polyamides derived from urea-formaldehyde or urea-melamine-formaldehyde are used in treating water supplies. With such chlorinated resins in water, a volume of gas (consisting of carbon dioxide, nitrogen and smaller amounts of carbon monoxide) equivalent to the volume of the chlorinated polymer may be produced in less than one day. This gas production is not only undesirable in the stated application, but represents a continuing loss of active chlorine and further appears to seal off a large proportion of the remaining chlorine, effectively removing it from utilization in water treatment. This tendency to self-destruction in such systems can be reduced to a low level by using a polyamide which has been prepared by using paraformaldehyde in place of formaldehyde to produce an improved polymer and by the use of special chlorination procedures. The procedure removes, prior to final chlorination, groups easily oxidised and thus produces a final product which is less susceptible to self-oxidation in the presence of water. (Sinha - OEIS)
W76-09060

THREE-MEDIA FILTRATION PLANT TREATS A PROBLEM WATER,
Queensbury Water Dept., New York.
T. K. Flaherty.
Public Works, Vol. 107, No. 4, p 67, April, 1976.

Descriptors: *Water treatment, *Water works, *Treatment facilities, *Color, Water supply, Rivers, Wells, Filtration, Activated carbon, Potable water, New York, Hudson River.
Identifiers: Dual media filters, Activated carbon filters.

Droughts which increased the hardness and iron content of the well water supply of Queensbury, New York, as well as decreasing well output, forced the city to tap the Hudson River as a source of municipal water. Although the river is polluted from municipal and industrial sources with a color content that may exceed 20 units, it is readily amenable to treatment. The main feature of the 3 mgd treatment plant is two automatic backwash filters containing three media types. One of the filters contains a 16 inch bed of granular activated carbon with an 8 x 30 mesh, while the other filter is a dual media filter containing sand and Anthrafilt. Raw water taken from the Hudson is passed through screens which are cleaned by reversing the flow. The inflow is split between two lines which feed identical parallel treatment processes, which can operate separately or simultaneously. In each treatment sequence, the water flows into a rapid mixing basin where alum, caustic soda and chlorine are added for coagulation, pH adjustment, and disinfection, respectively. Water then flows through flocculation basins where activated carbon, potassium permanganate and a polymer may be added. The water is then retained for three hours in rectangular electrifiers. Clarified water is fed to the dual media filter and then to the carbon bed filter. Backwashing is initiated by loss of head, automatically, or at specified time intervals. The filtered water is chlorinated, neutralized, and stored before being released to the distribution system. (Orr-FIRL)
W76-09155

ALUM SLUDGE FROM WATER PLANT CONDITIONS SEWAGE SLUDGE,
Wayne State Univ., Detroit, Mich. Dept. of Civil Engineering.
D. Y. Hsu.
Water and Sewage Works, Vol. 123, No. 3, p 62-64, March, 1976. 3 fig, 12 ref.

Descriptors: *Water treatment, *Waste water treatment, *Sludge treatment, Potable water, Polyelectrolytes, Dewatering, Polymers, Lagoons, Sewage sludge.
Identifiers: Alum sludge.

Water treatment plants supplying potable water produce their own waste water in the form of sludge from sedimentation tanks. Use of small doses of polyelectrolytes instead of alum reduces the amount of sludge. The sludge produced is also easier to dewater and incinerate. Because of the higher cost of the polymers, a combination of alum and polymers may be used. The simplest method of on-site treatment of alum sludge is sludge lagooning. The same function, that of thickening the sludge, can also be performed by gravity thickeners. The most important subsequent procedure for treating the sludge is dewatering. Usually, the sludge is conditioned either physically or chemically and then dewatered mechanically. Treating sludge from water treatment together with waste water sludge is the most promising method for treating alum sludge off-site. When properly thickened and mixed with waste water sludge, alum sludge can be used to condition it for dewatering. (Snyder-FIRL)
W76-09163

WATER SUPPLY AND SEWAGE TREATMENT IN ARID AREAS,
For primary bibliographic entry see Field 5D.
W76-09166

REVERSE OSMOSIS TODAY,
For primary bibliographic entry see Field 5D.
W76-09169

COMBINED UTILITY PROVIDES WATER AND WASTEWATER TREATMENT.
For primary bibliographic entry see Field 5D.
W76-09177

FLOW VELOCITY AS A RATE DETERMINING FACTOR FOR SELF-PURIFICATION IN RIVERS (UBER DEN EINFLUSS DER STROMUNGSGESCHWINDIGKEIT AUF DIE SELBSTREINIGUNG IN FLIESSGEWAESSERN),
K. Wuhrmann, E. Eichenberger, H. A. Leidner, and D. Wuest.
Schweizerische Zeitschrift fuer Hydrologie, Vol. 37, No. 2, p 253-272, 1975. 8 tab, 5 ref.

Descriptors: *Rivers, *Model studies, Flow rates, *Flow velocities, *Kinetics, Waste assimilative capacity, *Self-purification, Path of pollutants.
Identifiers: Active transport.

Experiments have been conducted on the self-purification rate of model rivers using the function of the concentrations of pollutants and the flow velocity. Velocities of 24, 13, and 3.7 cm/sec were employed, with all other parameters remaining constant. Results indicated that the ratio of the rates of substrate transport from the flowing wave to cell surfaces and of active transport in substrate uptake is the determining factor for the rate of self-purification. Contrary to expectation, this ratio decreases rapidly with decreasing water flow velocities. Results were based on the kinetics of active transport. (Kramer-FIRL)
W76-09204

MICROFLOCCULATION--COMPARATIVE EXPERIMENTS BETWEEN SINGLE AND DOUBLE LAYER FILTERS WITH IRON AND ALUMINUM SULFATE (MICROFLOCKUNG--VERGLEICHSVERSUCHE ZWISCHEN EIN-UND ZWEISCHICTEILTERN MIT EISEN-UND ALUMINUMSULFAT),
M. Schalenkamp.
Gas-Wasser-Abwasser, Vol. 55, No. 9, p 508-515, 1975. 24 fig, 3 ref.

Descriptors: *Water treatment, *Flocculation, Filtration, *Filters, Water quality control, Chlorination.
Identifiers: Alum, Iron sulfate, *Microflocculation, Aluminum sulfate.

Microflocculation tests in single and double layer filters with and without iron sulfate and aluminum sulfate were carried out with chlorinated lake water at the Lengg waterworks in Switzerland. Both the filter cycle and the purification efficiency (in terms of turbidity, detritus and phytoplankton) were poor when aluminum or iron sulfate doses of 8 mg/liter were used. Microflocculation was efficient with 2 mg/liter doses of either iron or aluminum sulfate, particularly aluminum sulfate, and was consistently more efficient than without flocculating agents. Therefore, chlorinated lake water, with a suspended solids content of 5-20 mg/liter, is

treated by microflocculation with aluminum sulfate (2 mg/liter). A flocculating aid (0.2 mg/liter) may also be added. (Takacs-FIRL)
W76-09206

QUALITY ASSURANCE FOR GROUNDWATER,
For primary bibliographic entry see Field 5G.
W76-09213

RECENT TRENDS OF PROCESS CONTROL FOR WATER WORKS AND DRAINAGE (JOGESUIDO PUROSESU SEIGYO NO DOKO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
For primary bibliographic entry see Field 5G.
W76-09214

HEPATITIS ATTRIBUTED TO POLLUTED STREAM,
Pierce County Health Dept., Tacoma, Wash.
For primary bibliographic entry see Field 5C.
W76-09220

MONOGRAPH OF THE EFFECTIVENESS AND COST OF WATER TREATMENT PROCESSES FOR REMOVAL OF SPECIFIC CONTAMINANTS. VOL. 1. TECHNICAL MANUAL,
Volkert (David) and Associates, Bethesda, Md.
I. C. Watson, S. J. Spano, H. N. Davis, and F. M. Heider.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 442, $10.00 in paper copy, $2.25 in microfiche. EPA Report No. 430/9-75-008, August 1974. 335 p. 101 fig., 26 tab., 3 append. EPA 68-01-1833.

Descriptors: *Potable water, *Water purification, *Costs, *Technology, *Water pollution treatment, Pollutants, Physical properties, Chemical properties, Heavy metals, Organophosphorus compounds, Radioisotopes, Disinfection, Organoleptic properties, Foam separation, Water quality control, Water storage, Water tanks, Distribution systems, Sodium, Public health, Water quality standards, Pesticide removal.
Identifiers: Technical manual.

The cost and technical data for water treatment and other techniques which, when applied, will result in the production of water whose constituent limits conform to applicable federal standards, are compiled, together with capital cost analyses and operating cost data. Standards and treatment methods are given for bacteria, odor, color, turbidity, arsenic, barium, cadmium, chromium, fluorides, copper, cyanide, foaming agents, organics-carbon chloroform extract, lead, iron, manganese, mercury, nitrates, selenium, silver, sodium, various pesticides, common organophosphates, radioactive contaminants, sulfates, zinc, and tritium. Discussed also are methods of water source protection, treated water storage, control of water quality in distribution systems, and water treatment processes and associated costs. Guidelines are provided for treatment process selection and their effectiveness, giving unit cost curves. Appendix A gives federal bacteria standards and guidelines, and Appendix B discussed sodium levels in treated water as they relate to public health. The information is directed to utilities and engineering consultants in devising preliminary plans and cost estimates for improved water supply facilities. (Auen-Wisconsin).
W76-09227

EPA STANDARDS FOR DRINKING WATER BECOME EFFECTIVE IN JUNE, 1977.
The Johnson Drillers Journal, Vol. 48, No. 2, p 5-8, March-April, 1976. 3 fig, 4 tab.

Descriptors: *Potable water, *Federal government, *Water quality control, *Water quality act, Standards, Organic wastes, Inorganic wastes, Water analysis, Sampling, *Water quality standards.
Identifiers: *Safe Drinking Water Act of 1974, *National standards, Enforcement of standards, Water systems classification, Community water systems, Non-community water systems, Small community water systems, Contaminant levels, Sampling frequencies.

The Federal Environmental Protection Agency issued interim primary drinking water regulations on December 10, 1975, as the first step in setting national standards for drinking water quality, under the provisions of the Safe Drinking Water Act of 1974. The standards become effective in June, 1977, and will apply to all public water systems. Primary responsibility for enforcing the standards will rest with state governments, but if a State fails to demonstrate its enforcement ability, EPA will take over enforcement. Two classes of water systems are defined; community water systems, and non-community water systems. The community system supplies at least 15 service connections used by year-round residents or serves at least 25 year round residents. All other public water systems are defined as non-community systems. Non-community systems basically service transients. They include hotels, motels, restaurants, service stations, and campgrounds; some schools, factories and churches also fall in this category. Special rules apply to small community water systems which would be severly stressed by the economic imposition of a large treatment facility. Siting requirements for wells are outlined by the standards and state that new wells will not be located in areas subjected to disaster such as floods, earthquakes or fires which would cause a breakdown of the system. Contaminant levels and sampling frequencies are also set. (Heiss-NWWA)
W76-09356

5G. Water Quality Control

BIODEGRADATION OF POLYNUCLEAR AROMATIC HYDROCARBON POLLUTANTS BY SOIL AND WATER MICROORGANISMS,
Illinois Univ. at Urbana-Champaign. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-08752

POTENTIALLY BENEFICIAL USES OF SULFURIC ACID IN SOUTHWESTERN AGRICULTURE,
Arizona Univ. Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3F.
W76-08766

ASSESSMENT AND ERADICATION OF HEAVY METAL POLLUTION IN A PLANNED URBAN ENVIRONMENT,
For primary bibliographic entry see Field 5C.
W76-08795

THE IN VITRO SENSITIVITY OF SOME SPECIES OF CHLOROPHYCEAE TO A SELECTED RANGE OF HERBICIDES,
Saskatchewan Univ., Regina. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W76-08824

RATIONALE FOR A WATER POLLUTION CODE PART 1: THE WASTE SYSTEM AND THE NATURAL SYSTEM,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
I. G. Wallis.
International Journal of Environmental Studies, Vol. 8, No. 1, p 5-16, 1975. 2 fig., 72 ref.

Descriptors: *Pollutants, *Environmental effects, *Waste disposal, *Balance of nature, *Recycling, Ultimate disposal, Waste assimilative capacity, Byproducts, Forecasting, Persistence, Ultimate disposal, Australia, Water pollution, Water quality standards, Model studies.
Identifiers: *Waste impact, Waste load, Environmental impact.

A water pollution code to balance the interests of people as waste generators against the unpleasant consequences of waste discharge must be based on the flow of materials between man and the natural environment and the impact of these on natural systems. The flow of wastes is divided into five parts: (1) Waste generation, (2) waste treatment, (3) waste transport, (4) waste interaction, and (5) waste decay. The processes involved in each part of the waste system are described, and can be modelled for each type of waste, though the accuracy of the models depends on the type of waste and the area of discharge. Overall, the distribution of wastes cannot be predicted to any more than an order of magnitude. Parameters quantifying the change in the natural system in respone to the waste load, defined as the waste impact, are also grouped into five areas: (1) Risk to human health, (2) monetary cost or loss, (3) amenity use, (4) key biological species, and (5) ecological structure. Waste impact models, despite their large margin of error, enable consequences of a range of different waste loads to be predicted. These predictions are required to more effectively evaluate the cost-benefit tradeoff of improved water quality. (Luedtke-Wisconsin).
W76-08839

MANAGEMENT OF WASTE HEAT AT NUCLEAR POWER STATIONS, ITS POSSIBLE IMPACT ON THE ENVIRONMENT, AND POSSIBILITIES OF ITS ECONOMIC USE,
Atomic Energy Commission, Washington, D. C.
W. G. Belter.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a Symposium held at Oslo, August 26-30, 1974. p 3-23, 3 tab, 60 ref.

Descriptors: *Thermal effects, *Heated water, Nuclear powerplants, Effluents, Standards, Water quality standards, Management.

Concern over the effects of rising temperatures in surface waters and the limited long-term availability of adequate cooling-water supplies have resulted in a trend towards the use of closed-cycle cooling systems. The development of dry-cooling tower systems is proceeding for use in water-short areas. Research is continuing on the ecological effects of heated water discharges. EPA effluent guidelines can have a significant bearing on the direction and extent of future thermal-effects research. A continuing energy shortage may provide a stimulus into research on beneficial uses of waste heat. (See also W76-08848) (Chilton-ORNL)
W76-08849

FOG FORMATION AND FOG ELIMINATION,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany).
P. Berliner.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 75-84, 4 fig, 5 ref.

Descriptors: *Environmental engineering, *Fog, *Environmetal control, Numerical analysis.

The process phases of fog formation and natural fog elimination were demonstrated on psychrometric charts. The phases are identified as (1) enthalpy rise of air within the non-saturation range; (2) fog formation in the air leaving the saturation state; (3) elevation of the warmed air to the top of the chimney; (4) mixing of warmed air with

the ambient air within the two-phase range of saturation; (5) condensation of warmed air on the ground; and (6) enthalpy decrease of air within the non-saturation range. Possible operation processes to prevent fog are summarized as (1) increase of heat transfer surface to reduce the cooling-water temperature; (2) increase of air rate to reduce the enthalpy rise beyond the saturation line; (3) application of dry convective cooling in closed cycles; (4) mixing of supersaturated moist air with separately warmed dry air; (5) evaporation and subsequent dry operation; and (6) dry operation and subsequent evaporation. (See also W76-08848) (Chilton-ORNL)
W76-08854

COOLING TOWER EXPERIENCE AND THE METEOROLOGICAL CONSEQUENCES OF THERMAL DISCHARGES FROM NUCLEAR POWER PLANTS IN THE FEDERAL REPUBLIC OF GERMANY,
Deutscher Wetterdienst, Offenbach am Main (West Germany).
H. Bartels, and J. W. Caspar.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820. Proceedings of a symposium held at Oslo, August 26-30, 1974. p 85-98, 11 fig, 6 ref.

Descriptors: *Model studies, Environmental effects, *Meteorology, Cooling towers, Atmosphere, Air pollution effects.
Identifiers: Plume.

Studies of the form and extent of thermal discharges in relation to atmospheric conditions are summarized. To predict the expected effects of a cooling tower, different computation models were established simulating the diffusion of a cooling tower vapour plume in the atmosphere. Simultaneously with the atmospheric measurements, the meteorological parameters of temperature and humidity must be measured within the cooling tower. Measurements reveal that considerable differences may exist at different places within the tower, especially when strong winds prevail. Results of the model studies are given, including the extent of the changes of air temperature, air humidity, shadows due to clouds and precipitation depending on the site and type of cooling tower. (See also W76-08848) (Chilton-ORNL)
W76-08855

SEASONAL FEATURE OF THERMAL ABATEMENT OF SHORELINE DISCHARGES AT NUCLEAR SITES,
Bhabha Atomic Research Centre, Bombay (India). Environmental Studies Section.
P. R. Kamath, I. S. Bhat, R. P. Gurg, B. B. Adiga, and S. Chandramouli.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a Symposium held at Oslo, August 26-30, 1974. p 217-225, 4 tab, 3 fig, 4 ref.

Descriptors: *Environmental effects, *Thermal pollution, Seasonal, Nuclear powerplants, Coasts, Lakes, Stratification, Dissolved oxygen.

Temperature measurements of condenser discharges were made at two nuclear stations, Tarapur at a coastal site and Rajasthan at an inland site. At Tarapur, the discharges are released through two canals on either side of the intake. One canal operates from the start of rising tide to peak and the other canal takes over as the tide recedes. The lowering of effluent temperature through a traverse in the canal is small. At first mixing with seawater, there is a drop of 3-4 degrees C from the outfall temperatures. Observations confirm that the region of thermal influence at Tarapur is not likely to extend beyond 1 km from the outfall in all directions. During the three month monsoon season, effects of thermal discharge will not be felt. Seasonal and diurnal temperature changes are greater at Rajasthan site. The lake is highly stratified and water movement is basically dependent on wind speed and direction. Seasonal high temperatures affect lake turnover. Similar turnovers were investigated at the reactor site. The turnover phenomenon may apparently keep down the temperature rise through greater mixing but it causes an overall increase in pollutants and lowered dissolved oxygen content. (See also W76-08848) (Chilton-ORNL)
W76-08862

WASTE-HEAT DISPOSAL FROM STEAM ELECTRIC PLANTS WITH REFERENCE TO THE STOCHASTIC NATURE OF SOME ENVIRONMENTAL CONDITIONS AND TO THERMAL POLLUTION CONTROL REGULATIONS,
Energoprojekt, Belgrade, (Yugoslavia).
M. M. Mesarovic.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 311-330, 10 fig, 11 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Regulation, Heated water, Waste water(Pollution), Cooling towers, Probability, Nuclear powerplants, Electric powerplants.

The paper analyizes the environmental impact of waste-heat discharges from steam-electric plants with once-through cooling systems and with cooling towers in light of thermal pollution control regulations and water-temperature standards. Particular attention is given to siting criteria. It was concluded that a deterministic approach to the site selection may leadto conservative solutions concerning once-through cooling capabilities of natural water bodies. The probabilistic approach, which makes use of the stochastic nature of environmental conditions and lead requirements by assigning a quantitative probability of occurrence to every situation, proved to be realistic. From the viewpoint of nuclear power plants, this approach enables a better use of their geographically independent siting performances. (See also W76-08848) (Chilton-ORNL)
W76-08865

THERMAL DISCHARGE STUDIES ON THE GREAT LAKES-THE CANADIAN EXPERIENCE,
Ontario Hydro, Toronto.
W. R. Effer, and J. B. Bryce.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium, Oslo, August 26-30, 1974, p 371-388, 5 fig, 1 tab, 5 ref.

Descriptors: *Thermal pollution, *Environmental effects, Water cooling, Model studies, Fish, Benthos, Temperature, Seasonal, *Great Lakes, *Canada, Water quality standards.

Guidelines and criteria for once-through cooling systems are outlined. A model, which has been developed from on-site measurements, to predict thermal plumes under a range of conditions is discussed. Also discussed are models of sites which are used to solve problems of temperature distribution. Biological studies were made at Pickering site and Bruce site. At Pickering it was found that benthic fauna diversity was consistently but not significantly lower in the immediate discharge area. Low seasonal variations in diversity suggested that community stability was not reduced. The brown bullhead dominated the fish populations in the heated area. Periphyton growth was enhanced by increased currents and temperature. At Bruce, the benthic fauna populations decreased slightly but this may have been due to hydrogen sulphide from the heavy water plant. Most fish species were attracted to the discharge area of Douglas Point in the spring and fall but left when temperatures exceed their preferences in the summer months. Migration from the shoreline occurred in the winter. (See also W76-08848) (Chilton-ORNL)
W76-08869

DEVELOPMENT AND APPLICATION OF CRITERIA FOR MARINE COOLING WATERS,
Environmental Research Lab., Narragansett, R. I.
D. C. Miller, and A. D. Beck.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 639-657, 2 fig, 1 tab, 65 ref.

Descriptors: *Thermal pollution, *Water quality standards, Temperature, Cooling water, Thermal stress, Environmental control, Criteria.

The paper presents material for the development of general criteria for safe levels of thermal addition to coastal marine ecosystems and reviews the applicability of past studies on tolerance limits and sublethal thermal stress. Newly proposed marine temperature criteria recommend: (a) maximum acceptable incremental temperature rise over ambient during fall, winter, and spring to 2.2 degrees C; for summer, 1.1 C; (b) maintenance of characteristic daily temperature cycles, both in frequency and amplitude; (c) temperature ceilings for coastal regions having a sufficient data base; and (d) no rapid increases of thermal discharge. In applying criteria to heated water discharges, it is recommended that the cooling water process be evaluated as a unit, considering the potential impact of water intake and in-plant circulation as well as the discharge. Recommendations are made for implementing thermal criteria and include the prohibition of dilution pumping, siting of discharge on well-mixed waters and the use of near-bottom diffusers for efficient dissipation of heat. (See also W76-08848) (Chilton-ORNL)
W76-08885

REGULATIONS AND ENVIRONMENTAL INVESTIGATIONS ASSOCIATED WITH NUCLEAR STATION THERMAL DISCHARGES,
Ente Nazionale per l'Energia Elettrica, Rome (Italy). Direzione della Costruzioni.
L. Bramati, R. Gasparini, and D. Merluzzi.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 659-673, 3 tab, 4 fig, 2 ref.

Descriptors: *Thermal pollution, *Environmental effects, Water quality standards, Environmental control, Model studies, *Regulation, Europe.
Identifiers: Caorso Nuclear Power Station(Italy).

This paper describes a program which is being implemented at the Caorso nuclear power station. The details of the program are based on the results of hydraulic model tests. The impact of the station on the aquatic ecosystem will be considered from the points of impact on the intake area, thermal and mechanical impact on organisms carried through the condenser and tailrace, impact due to hot plume, and impact due to discharge of chemicals. Recently the Ministry of Public Health issued recommendations concerning the temperature limits for steam power stations located on the coast which include: (a) maximum water temperature, 35 degrees C; (b) temperature rise in the top layer (down to 2 m deep) at 1 km from the station discharge point, not more than 3 degrees C. (c) no thermal barriers in rivers or near river mouths. Alternatives indicated for the future are recourse to coastal sites and consequent power transmission to consumption centres inland or gradual adoption of cooling means (towers, spray systems, etc.) on inland continental sites. (See also W76-08848) (Chilton-ORNL)
W76-08886

CAN THE CRITERIA AND METHODOLOGY USED FOR RADIOACTIVE DISCHARGES BE APPLIED TO THERMAL DISCHARGES. (LES

CRITERES ET LA METHODOLOGIE RETENUS POUR LES REJETS RADIOACTIFS SONT-ILS TRANSPOSABLES AUX REJETS THERMIQUES.),
CEA Centre d'Etudes Nucleaires de Fontenay-aux Roses (France). Departement de Protection.
R. Coulon, G. Lacourly, and P. Bovard.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, Proceedings of a symposium held at Oslo, August 26-30 1974. p 675-681.

Descriptors: *Thermal pollution, *Environmental effects, *Radioactivity effects, *Standards, *Methodology, Cost-benefit theory, *Criteria.

The paper examines the points where problems resulting from thermal discharges and radiation exposure are similar or disimilar. Considering the fact that thermal discharges are primarily concerned with effects on the environment and radiation exposure problems primarily with the protection of man, the authors conclude that there are certain approaches which can be adopted in dealing with both problems. These approaches include the determination of critical points, the application of studies of justification of the damage incurred, and the application of cost-effectiveness concepts. (See also W76-08848) (Chilton-ORNL)
W76-08887

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
Conference Proceedings, Environmental Aspects of Chemical Use in Various Industrial Operations, May 21-23, 1975. Houston, Texas, 604 p. EPA 68-01-2928.

Descriptors: *Environmental effect, *Chemical properties, *Chemical analysis, *Chemical degradations, *Chemical reactions, *Water chemistry, *Oil wells, *Water wells, Groundwater toxicity, Water pollution effects.
Identifiers: *Well drilling operations, *Toxic industrial chemicals.

This conference was the second in a series of three on the environmental impact of chemicals in various industrial operations. The objective of the conference was to discuss current chemical uses, functions of chemicals in the operations, and by products resulting from the use of these chemicals. In addition, known health or environmental effects and measures used or available for use to control environmental contamination by these industrial chemicals was discussed. Twenty-two papers were presented and discussion held that covered industrial emissions and effluent surveys, chemicals and their effects, as well as reclamation and disposal. (See W76-08890 thru W76-08919) (Heiss-NWWA)
W76-08889

TECHNIQUES OF DEEP WELL DRILLING,
Exxon Co., Houston, Tex. Operations Dept.
For primary bibliographic entry see Field 8B.
W76-08890

TECHNIQUES OF SHALLOW WELL DRILLING,
Layne Atlantic Co., Norfolk, Va. Water Resources Div.
For primary bibliographic entry see Field 8B.
W76-08891

SOLUTIONS FOR SOME PROBLEMS RESULTING FROM REFREEZING OF PERMAFROST AROUND A WELLBORE,
Atlantic Richfield Co., Plano, Tex. Production Research Center.
For primary bibliographic entry see Field 8G.
W76-08892

DRILLING FLUID PRINCIPLES AND OPERATIONS,
N L Industries, Inc., Houston, Tex. Baroid Div.
For primary bibliographic entry see Field 8G.
W76-08893

WELL COMPLETION - TECHNIQUES AND METHODS,
Dowell Div., Tulsa, Okla.
For primary bibliographic entry see Field 8G.
W76-08894

TOXICITY STUDY - DRILLING FLUID CHEMICALS ON AQUATIC LIFE,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
For primary bibliographic entry see Field 5C.
W76-08895

FISH TOXICITY OF DISPERSED CLAY DRILLING MUD DEFLOCCULANTS,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
For primary bibliographic entry see Field 5C.
W76-08896

EFFECT OF DRILLING FLUID COMPONENTS MIXTURES ON PLANTS AND SOILS,
Utah State Univ., Logan. Dept. of Soil Chemistry.
For primary bibliographic entry see Field 5C.
W76-08897

ACUTE TOXICITY OF WELL-DRILLING TO RAINBOW TROUT,
Environmental Protection Service, Edmonton (Alberta). Aquatic Toxicology Lab.
For primary bibliographic entry see Field 5A.
W76-08899

THERMAL DEGRADATION OF DRILLING MUD ADDITIVES,
Halliburton Co., Duncan, Okla. Chemical Research and Development Dept.
For primary bibliographic entry see Field 8G.
W76-08901

GROUND WATER PROBLEMS ASSOCIATED WITH WELL-DRILLING ADDITIVES,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W76-08902

CHEMICAL APPLICATIONS IN OIL AND GAS WELL-DRILLING AND COMPLETION OPERATIONS,
Bartlesville Energy Research Center, Okla.
For primary bibliographic entry see Field 8G.
W76-08903

MOBILITY OF WELL-DRILLING ADDITIVES IN THE GROUND WATER SYSTEM,
National Water Well Association, Worthington, Ohio. Research Facility.
For primary bibliographic entry see Field 5B.
W76-08904

MOVEMENT OF CHEMICAL CONTAMINANTS IN GROUND WATER,
Dames and Moore, Park Ridge, Ill.
For primary bibliographic entry see Field 5B.
W76-08905

TOXICITY AND ENVIRONMENTAL PROPERTIES OF CHEMICALS USED IN WELL-DRILLING OPERATIONS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W76-08906

POTENTIAL EFFECTS OF OIL DRILLING AND DUMPING ACTIVITIES ON MARINE BIOTA,
North Carolina Univ. at Wilmington. Inst. of Marine Biomedical Research.
For primary bibliographic entry see Field 5C.
W76-08907

ENVIRONMENTAL IMPLICATIONS OF SEDIMENT BULK ANALYSIS TECHNIQUES FOR TRACE METALS IN OFFSHORE WELL-DRILLING OPERATIONS,
Gulf South Research Inst., New Orleans, La. Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W76-08908

EFFECTS OF DRILLING OPERATIONS ON THE MARINE ENVIRONMENT,
Exxon Co., Houston, Tex.
For primary bibliographic entry see Field 5G.
W76-08909

EFFECTS OF DRILLING OPERATIONS ON THE MARINE ENVIRONMENT,
Exxon Co., Houston, Tex.
R. P. Zingula.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975 p. 433-448, 10 fig, 1 tab, 3 ref.

Descriptors: *Waste disposal, *Drilling fluids, Sediments, Benthic fauna, Wells, Water pollution effects, Suspended solids, Crabs.
Identifiers: *Well cuttings, Grouper, Red snapper, Caustic, Barite, Chrome lignosulfonate.

Research studies conducted by Exxon scientists investigated the effect of offshore drilling operations on the marine environment. Water samples taken while the drilling operations was in progress show a very rapid drop of suspended solids in a short distance down current from the drilling rig. Scuba studies show mobile organisms active around and on borehole cutting accumulations, while drilling was in progress. After several months these cutting are turned into 'normal' sea bottom. Water samples also show that common chemicals normally used in drilling are present in small quantities, however, chemical interaction and dilution make their effect negligible. (See also W76-08889) (Heiss-NWWA)
W76-08909

TREATMENT AND DISPOSAL OF WASTE FLUIDS FROM ONSHORE DRILLING SITES,
Wilson Mud Service, Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5D.
W76-08910

THE TOXICITY OF DRILLING FLUIDS, THEIR TESTING AND DISPOSAL,
Alberta Energy Resources Conservation Board, Edmonton.
For primary bibliographic entry see Field 5D.
W76-08911

THE HANDLING AND TREATING OF WATER-BASED DRILLING MUDS,
Sun Oil Co., Richardson, Tex. Production Service Lab.
For primary bibliographic entry see Field 5D.
W76-08912

HANDLING AND TREATMENT OF OIL-BASE DRILLING MUDS,
Oil Base Inc., Houston, Tex.
For primary bibliographic entry see Field 8G.
W76-08913

WASTE WATER BASE DRILLING FLUID DISPOSAL,
Dresser Industries, Inc., Houston, Tex. Oilfield Products Div.
For primary bibliographic entry see Field 5D.
W76-08914

DISPOSAL OF DRILLING FLUIDS AND DRILLED-UP SOLIDS IN OFFSHORE DRILLING OPERATIONS,
Texas A and M Univ., College Station. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 5D.
W76-08915

OBJECTIVES OF WELL-DRILLING REGULATIONS,
National Water Well Association, Worthington, Ohio.
J. H. Lehr.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 555-566.

Descriptors: *Well regulations, Construction, Water wells, Technical writing, *Regulation, *Standards.
Identifiers: Water well construction standards, Well design, Technical water well manual.

Approximately 7 years ago the National Water Well Association recognized that the water well industry had no organized compendium of knowledge concerning recommended standards for well construction. This lack of systematic instruction has led to inadequately constructed wells which permitted surface water contact with, and consequent pollution of, ground water supplies. The Manual of Recommended Well Construction Standards was the National Water Well Association's answer to this problem. The National Water Well Association directed 33 experts over a period of 3 years and produced a stat-of-the-art manual entitled Manual of Recommended Well Construction Standards. This document gave detailed instructions to guide home owners, engineers, industries and municipalities as to the design specifications which best fulfill safety standards and constraints of the particular building situations. The document was submitted to the EPA in May, 1975. (See also W76-08889) (Heiss-NWWA)
W76-08917

RESPONSIBILITIES OF OFFSHORE DRILLING REGULATIONS,
Geological Survey, Metairie, La.
D. W. Solanas.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 571-575.

Descriptors: *Continental shelf, *Submerged Lands Act, Federal government, State governments, Well regulations, Gulf of Mexico.
Identifiers: *Continental shelf drilling, Drilling regulations, Drilling leases.

The passage of the Outer Continental Shelf Lands Act in 1953 set forth that the sea bottoms off the continental United States is owned by the federal government. Considerable dispute arose between the states and federal government after this legislation. As a result, the Submerged Lands Act gave a certain portion of the continental shelf to the coastal states. The federal government has jurisdiction over the areas not given to the states. The United States Geological Survey (USGS) then began to regulate outer continental shelf oil and gas drilling and producing operations. Their attention is concentrated in the Gulf of Mexico, where there are presently approximately 6,000 producing oil and gas wells. Responsibility for safe operation lies not only with the USGS, but principally with the lessees of the sites. (See also W76-08889) (Heiss-NWWA)
W76-08918

REGULATION OF ONSHORE AND OFFSHORE OIL FIELD WASTE DISPOSAL,
Texas Railroad Commission, Austin, Tex.
For primary bibliographic entry see Field 5E.
W76-08919

METHODS OF ESTIMATING RESIDENTIAL LAND USE FOR WATER RESOURCES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Economics.
For primary bibliographic entry see Field 4C.
W76-08924

PROBLEM OF BLOOD-SUCKING FLIES IN THE ZONES AFFECTED BY BIG WATER RESERVOIRS IN THE UKRAINIAN SSR, (IN RUSSIAN),
Zaporozhskii Gosudarstvennyi Meditsinskii Institut (USSR).
A. K. Shevchenko, and M. V. Steblyuk.
Vestn Zool. 5, p3-7, 1974.

Descriptors: *Insects, *Reservoirs, Insect behavior.
Identifiers: Anopheles-Maculipennis, *Blood sucking flies, *Flies, Simulium-Shevtshenkovae, Ukrainian-SSR, *USSR.

Qualitative and quantitative changes in blood-sucking fly composition and redistribution of developmental sites in certain big reservoirs of the Ukrainian SSR, USSR, are shown. Changes in fly development for an over 10 yr exploitation period of the Krasnooscolian reservoir, are analyzed. The effect of new environmental conditions on the species ecology or species and subspecies composition of flies is illustrated by a series of examples (Simulium shevtshenkovae; Anopheles maculipennis).--Copyright 1975, Biological Abstracts, Inc.
W76-08991

COATINGS FOR WASTEWATER TREATMENT PLANTS,
Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 8G.
W76-09014

INDUSTRIAL DEVELOPMENT THROUGH WATER-RESOURCES PLANNING,
Department of Commerce, Washington, D. C.
For primary bibliographic entry see Field 3E.
W76-09034

ENVIRONMENT PROTECTIVE OIL SKIMMING AND REMOVAL APPARATUS,
Sandco Limited, Ottawa (Ontario). (Assignee).
S. G. Fast.
U. S. Patent No. 3,947,360, 3 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 944, No 5, p 2454, March 30, 1976.

Descriptors: *Patents, *Oil pollution, Water quality control, Water pollution sources, *Oil spills, Water pollution treatment, *Water pollution control, Oily water Skimming, Application equipment, *Separation techniques, *Pollution abatement.
Identifiers: Oil collection, Conveyor belts, Catamaran-type boats.

To facilitate the collection of oil spills from the water an oil skimming apparatus mounted on a catamaran-type boat is used. The boat is provided with drive means, a holding tank and a centrally placed conveyor. The conveyor is comprised of one or more endless, smooth and unperforated belts preferably of hardened band steel which has good adheslvity with regard to oil. The lower end of the conveyor is lowered just below the surface of the water so that as the boat is driven through the water the belts collect the oil and bring it to the upper end of the conveyor where scrapers direct the oil into holding tanks located on each side of the conveyor. (Sinha-OEIS)
W76-09048

METHOD AND APPARATUS FOR SEPARATING OIL FROM AQUEOUS LIQUIDS,
For primary bibliographic entry see Field 5D.
W76-09054

METHOD AND APPARATUS FOR SEPARATING OIL FROM AQUEOUS LIQUIDS,
For primary bibliographic entry see Field 5D.
W76-09055

METHOD FOR CLARIFYING OILY WATER MIXTURES,
Exxon Research and Engineering Co., Linden, N.J. (Assignee).
R. R. Goodrich, and E. R. Corino.
U.S. Patent No. 3,948,770, 3 p, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 322, April 6, 1976.

Descriptors: *Patents, *Oily water, *Oil pollution, Water pollution treatment, Water quality control, Water pollution control, Water purification, Flocculation, *Separation techniques, Montmorillonites, Polyelectrolytes, Anions, *Settling basins.
Identifiers: Oil tankers, Synergistic effects, Clarification.

When small quantities of oil are finely dispersed within the relatively large body of water, typically found in the slop tanks of large oil tankers, the settling of the fine droplets of oil is extremely slow. Rapid settling may be obtained by the use of a flocculating agent which comprises a dry powder mixture of a sodium or calcium montmorillonite clay with an anionic polyelectrolyte, typically an anionic copolymer of acrylamide. Such a combination of powders may be dispersed within the tank where it accumulates the fine oil drops, agglomerating them and assisting in their separation from the water by rising to its surface. The interaction of the clay and anionic polyelectrolyte is an important aspect. A synergistic effect occurs since neither of the individual components is particularly effective to assist in the settling of the finely dispersed oil droplets. The rapid separation which is produced by the flocculating agent permits the efficient separation of oil and water with the oil/floc mixture rising to the surface, thus permitting the disposal of clear water to the sea. (Sinha - OEIS)
W76-09057

INFECTION OF BROAD-CLAWED CRAYFISH WITH BRANCHIOBDELLA AND CONTROL MEASURES AGAINST THEM, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Institut Zoologii i Parazitologii.
For primary bibliographic entry see Field 2H.
W76-09086

RECLAMATION OF ACIDIFIED LAKES - MIDDLE AND LOHI, SUDBURY, ONTARIO,
J. M. Adamski, and M. F. P. Michalski.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 1971-1983, 1975. 5 fig., 6 tab., 3 ref.

Descriptors: *Hydrogen ion concentration, Surface waters, Freshwater, *Water quality, Water management(Applied), *Acidic water, Acidity, *Calcium carbonate, *Calcium hydroxide, Air pollution, *Phytoplankton, Waste treatment, Water pollution control, *Canada.
Identifiers: Smelters, *Acidified lakes, Sudbury(Ontario), Calcium levels, pH profiles.

Chemical manipulation of acidic lakes by addition of calcium hydroxide and calcium carbonate represents a return to the lakes natural state. Field

experiments indicate that the treatment is a simple, effective, and relatively inexpensive water management tool for reclaiming acidic lakes. (Katz)
W76-09108

ENVIRONMENTAL CHANGES IN A PORTION OF LAKE ONTARIO FOLLOWING POLLUTION ABATEMENT,
For primary bibliographic entry see Field 5C.
W76-09119

A GUIDE TO STATE PROGRAMS FOR THE RECLAMATION OF SURFACE MINED AREAS,
Geological Survey, Reston, Va.
E. A. Imhoff, T. O. Friz, and J. R. LaFevers.
Circular 731, 1976. 33 p, 14 fig, 2 tab, 13 ref.

Descriptors: *Land reclamation, *Strip mines, *Programs, *State governments, Land classification, Strip mine lakes, Farm ponds, Governmental interrelations, Social aspects, Economics, Political aspects, Pollution abatement, Water pollution control.

During 1975 inquiries of agencies in each state and review of state statutes and related administrative codes revealed that 38 states have established programs requiring the reclamation of surface mined lands. Results of analyses of those programs and ancillary data are presented in: (1) A table (matrix) which has been designed for the notation and elaboration of information pertaining to the mined-area reclamation programs of the 50 states; (2) a primer on surface mining activities and related reclamation practices and problems; and (3) a listing of types of non-Federal governmental controls applicable to reclamation. Photographs of reclaimed surface mined lands show recreational lakes, farm ponds, and farmland. (Woodard-USGS)
W76-09142

DECISION PERSPECTIVES ON URBAN STORM WATER POLLUTION,
GKY and Associates, Alexandria, Va.
G. K. Young.
Water Resources Research, Vol. 12, No. 1, p 94-100, February, 1976. 2 fig, 2 tab, 10 ref.

Descriptors: *Storm runoff, *Urban runoff, Design, Analytical techniques, *Sewerage, Model studies, *Decision making, Water quality standards, *Combined sewers, Water pollution control, Pollution abatement.

The major features of an urban runoff, combined sewer system are described and several options for control of water pollution that occurs during rainstorms in urban areas are considered. A macroanalytical approach to defining the problem is presented in which typical values of the variables are assigned and a sensitivity analysis of urban storm-induced pollution to various control measures is demonstrated. This method should work as a screening mechanism to choose between candidate urban areas for the allotment of funds to solve pollution problems. A pollutograph scale may thus be calculated with maximums and ranks, related to the water quality standards, and thus specific control measures tailored for each city may be defined. (Kramer-FIRL)
W76-09207

DESIGN OF NATIONWIDE WATER-QUALITY-MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-09209

CRITERIA FOR SELECTING A WATER QUALITY MODEL FOR 208 PLANNING,
Hydrocomp Inc., Atlanta, Ga.
T. N. Debo, and A. M. Lumb.
Simulation Network Newsletter, Vol. 6, No. 2, p 1-5, August 15, 1975. 1 ref.

Descriptors: *Water quality control, *Planning, *Model studies, *Water quality standards, Long-term planning, Land use, *Water Pollution Control Act, *Criteria, South Carolina.
Identifiers: 208 planning, Federal Water Pollution Control Act Amendments.

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 sets forth a planning program whose results will be used for the allocation of waste load and construction funds for pollution abatement. Modeling will be used to extend the results of short-term monitoring and sampling to construct an adequate data base. It will also be used to predict the effects of various land use and growth alternatives and water quality management plans on water quality. General criteria for model selection were developed in two 208 studies in South Carolina. The model must be able to analyze small and large streams and lakes and to adjust to changes in program objectives. It must also represent all major processes and interrelationships in the real system. The model must be able to handle non-equilibrium conditions. The model should have flexibility in the number of processes simulated, the number of segments of the aquatic system analyzed, and the time period simulated. It should also be able to continuously simulate water quality for several years and consider weather conditions in the analysis of nonpoint sources. Costs from computer use, program adaptation and maintenance, modification to specific needs, training time, and time for input preparation and application must be considered together with effectiveness of the model. Detailed criteria will be different for individual areas. (Snyder-FIRL)
W76-09212

QUALITY ASSURANCE FOR GROUNDWATER,
Environmental Science and Technology, Vol. 10, No. 3, March, 1976. 2 fig.

Descriptors: *Water quality control, *Groundwater, *Water supply, *Potable water, Groundwater resources, Water pollution sources, Monitoring, Legislation, *Water quality standards.
Identifiers: Safe Drinking Water Act of 1974.

As of August 1975, about 100 million Americans were dependent upon underground sources of drinking water. Recently, underground injection of waste water and other means by which groundwater may become polluted have become a matter of concern. The Safe Drinking Water Act of 1974 (PL 92-523), signed into law in December 1974, provides for the establishment of state programs for protection of underground potable water sources. Under the drinking water law, the EPA administrator designates which states must design groundwater quality control programs. It was mandated that by 180 days after the enactment of PL 92-523, the EPA administrator must have published proposed regulations for state underground injection control programs and that promulgation of these regulations was to have occurred by the next 180 days. As of the beginning of 1976, the regulations are still in the proposed stage. Sources for potential groundwater contamination include brines from secondary and tertiary oil recovery, industrial waste injection wells, petrochemical operations wastes, and leachates from sanitary landfills. Injection wells must be monitored by the states or in the absence of a satisfactory state program, the EPA will monitor. In addition to the control of groundwater pollution by the EPA, the World Health Organization Collaborating Committee on Surface and Ground Water Quality is developing the following on an international basis: uniform methods for monitoring water quality; uniform analytical instruments; and, uniform data storage and retrieval systems. (Orr-FIRL)
W76-09213

RECENT TRENDS OF PROCESS CONTROL FOR WATER WORKS AND DRAINAGE (JOGESUIDO PUROSESU SEIGYO NO DOKO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
E. Bannai, T. Sumi, T. Matsuoka, and K. Kuwayama.
Toshiba Rebyu, (Toshiba Review), Vol. 31, No. 1, p 5-8, January, 1976. 5 fig, 1 tab, 2 ref.

Descriptors: *Monitoring, *Water pollution control, *Regional development, *Waste water treatment, Sewage treatment, Water reuse, Automatic control, Computers, Water works, Water supply, Water treatment, Drainage, *Control systems.
Identifiers: *Japan.

To cope with a rapid increase in demand for water and increased pollution of natural waters, recent trends in Japan have included the development and regional utilization of water resources for water works, the expansion of facilities, the collective processing in river basin scales, and the reuse of processed sewage. A major problem is the utilization of such resources as dams, rivers, and the sea. New technology is being developed in regional monitoring systems. A description is provided of those control systems developed by Toshiba, including computer control and instrumentation control. (Kramer-FIRL)
W76-09214

NORTHERN GREAT PLAINS RESOURCE PROGRAM. SURFACE RESOURCE WORK GROUP. -REGIONAL PROFILE.
Northern Great Plains Resource Program, Denver, Colo.
For primary bibliographic entry see Field 4C.
W76-09228

CAPABILITIES AND COSTS OF TECHNOLOGY ASSOCIATED WITH THE ACHIEVEMENT OF THE REQUIREMENTS AND GOALS OF THE FWPCA OF 1972 FOR PULP AND PAPER INDUSTRY.
Hazen and Sawyer, New York.
Available from the National Technical Information Service, Springfield, Va., 22161, as PB-242 376, $12.00 in paper copy, $2.25 in microfiche. Report No. NCWQ 75/01, May 1975. 472 p. 30 fig., 40 tab., 24 ref., 5 append. WQ5AC003.

Descriptors: *Pollution abatement, *Pulp and paper industry, *Costs, *Technology, *Waste water treatment, Capital costs, Operating costs, Maintenance costs, Water pollution control.
Identifiers: Zero waste discharges.

The pulp and paper industry is analyzed to examine its capabilities and costs of technology associated with the achievement of federal requirements for pollution abatement for 1977 to 1985. Cost estimates include capital, operating, and maintenance costs of internal and external measures needed to achieve the five selected pollution abatement levels. Cost of money, depreciation, insurance, taxes, etc., are not included. Average discharges into surface waters for January 1973 were 5200 mgd wastewater, 9,000,000 lbs/day BOD and 6,400,000 lbs/day suspended solids. To meet the 1977 EPA requirements, pollution abatement costs for Level I would be $1.88 billion above that spent up to 1973 and increase the O and M cost to $98 million per annum; Level II would require a capital investment of $2.03 billion beyond that spent up to 1973 and direct O and M expenses would increase by $104 million per annum. Internal improvements might achieve Levels III and IV without upgrading existing secondary biological facilities. The large capital cost of such improvements would be somewhat offset by savings in O and M expense. Substantial reduction of effluents would be achieved only if internal improvements are instituted. Residuals generated to achieve the waste load reductions would be increased by approximately 1,960,000 lbs

of dry solids per day to a total of 8,612,000. (Auen-Wisconsin).
W76-09229

WATER RESOURCES POLICY ISSUES - 1975.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-09230

POLLUTION FROM NON-POINT SOURCES,
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5B.
W76-09232

HEAVY METALS IN THE AQUATIC ENVIRONMENT.
For primary bibliographic entry see Field 5B.
W76-09272

CANADIAN EXPERIENCE WITH THE REDUCTION OF MERCURY AT CHLOR-ALKALI PLANTS,
Canadian Industries Ltd., Montreal (Quebec).
F. J. Flewelling.
In: Proceedings of an International Conference on Heavy Metals in the Aquatic Environment, December 4-7, 1973, Nashville, Tennessee (Pergamon Press Ltd., c1975), p 253-260. 3 tab.

Descriptors: *Mercury, *Bleaching wastes, *Canada, *Water pollution, *Air pollution, Pollutants, Water pollution sources, Statistics, Pollutants, Water quality standards, Wastes, Industrial wastes, Chlorine, Water pollution control, Sodium compounds, Alkali metals, Metals, Heavy metals, Poisons.
Identifiers: *Chlor-alkali plants, Bleached pulp mills.

Statistical and legislative data are given on mercury discharges into waterways and into the atmosphere from chlorine-generating plants in Canada and (for comparison) in the U.S.A. Although significant pollution abatement has been achieved by various control measures, more remains to be done to comply with planned regulatory effluent standards. Several problems awaiting solution are mentioned, such as accounting for lost mercury via an adequate materials balance. (Brown-IPC)
W76-09273

ECONOMICS AND ENERGY: REDUCING MILL ENERGY CONSUMPTION AND EFFLUENT VOLUME,
Ekono Inc., Bellevue, Wash.
M. Kojo.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975, Preprinted Proceedings, (Montreal, P.Q.), p 77-82. 2 fig, 4 ref, 6 tab.

Descriptors: *Pulp wastes, *Energy, Wastes, Industrial wastes, Water pollution sources, Heat balance, Canada, Foreign countries, Effluents.
Identifiers: *Energy conservation, *Kraft mills, Weyerhaeuser Canada Limited(Canada).

The possibilities for reducing energy consumption in kraft pulp mills is discussed, using the Kamloops, British Columbia, mill of Weyerhaeuser Canada Limited as an example. Levels of consumption and possible energy savings are shown for the different operations throughout the mill (chip handling, cooking, washing, black liquor evaporation, recausticizing, lime burning, pulp screening and cleaning, bleaching, and drying). The reduction of energy consumption and its effect on the effluent stream of the mill is discussed briefly. (Witt-IPC)
W76-09299

OCEAN DUMPING--A RATIONAL APPROACH TO AN INTERNATIONAL PROBLEM,
Naval Oceanographic Office, Washington, D.C.
S. B. Nelson, and R. C. Tipper.
In: IEEE 1971 Engineering in the Ocean Environment Conference, San Diego, California, September 21-24, 1971, p 317-320, 4 ref.

Descriptors: *Continental shelf, *Environmental effects, Water resources development, Water pollution effects, *Water quality standards, *Waste disposal, Waste water disposal, Optimum development plans, Management.
Identifiers: *Outer Continental Shelf, Environmental impact, *Ocean dumping, Enforcement, Offshore technology.

A detailed look at the overall problem of ocean dumping is provided and a discussion is presented on U.S. regulations, international efforts, and an approach to the problem of ocean dumping. A systematic approach, starting with identification of types of wastes, determination of environmental effects, and providing specifications for disposal is reviewed. Enactment of legislation, identification of regulatory authority, and the establishment of a workable enforcement system are also discussed. Emphasis must be placed on evaluation of the environmental effect of any given waste. There is a critical need for research which will carefully evaluate the assimilative capability of various regions of the ocean for the spectrum of human wastes and which will promote the establishment of realistic marine water quality standards. This knowledge is the cornerstone of effective management of ocean dumping. (Sinha-OEIS)
W76-09304

SURFACE EFFECTS SKIMMER DEVELOPMENTS,
Science Applications, Inc., McLean, Va.
N. P. Trentacoste.
Available from National Technical Information Service, Springfield, Va., 22161, as PB-242 391 $5.00 in paper copy, $2.25 in microfiche. Environmental Protection Agency Report No. EPA-670/2-75-066, June 1975. 80 p, 27 fig, 18 tab, 31 ref, append.

Descriptors: *Continental shelf, *Environmental effects, Resources development, *Oil pollution, *Oil spills, Water pollution, Water pollution treatment, *Water pollution control, Skimming, Application equipment, Waves(Water), Currents(Water), Separation techniques, Oil-water interfaces, Model studies, Water pollution effects.
Identifiers: *Outer Continental Shelf, Offshore technology, Environmental impact *Oil slicks, Air jets, Polyurethane foam belts, Surface effects skimmer.

An experimental program investigated the use of a Surface Effects Skimmer in removing thin film oil slicks spread over large water areas by fast currents. The skimmer uses a directed air jet to separate and lift spilled oil from the surface of the water in the form of a spray consisting of oil and water droplets. The oil/water spray is directed toward a rotating belt of polyurethane foam from which it is squeezed and pumped to a nearby storage tank. Initial experiments were performed in a 20 cm wide flume. Subsequent tow tank tests were conducted at speeds up to 3.25 knots in calm, choppy and smooth wave conditions with oils ranging from a very viscous Venezuelan crude to a very light No. 4 distillate fuel oil. During tests at a tow speed of 3.25 Kts in the presence of 13.75 cm high waves oil collection efficiencies of more than 80% were achieved with the Venezuelan crude oil and of about 60% with the No. 4 distillate fuel oil. In a related series of experiments, it was found that presoaking the polyurethane foam belt in either water or oil had no effect on its ability to retain oil. (Sinha - OEIS)
W76-09308

WIND AND CURRENT EFFECTS ON LARGE-SCALE OIL SLICKS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S. P. Murray.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-A012 582 $3.50 in paper copy, $2.25 in microfiche. LSU Technical Rept. No. 193, September 1975. 14 p, 10 fig, 8 ref., Also as: Reprint from Preprints, Offshore Technology Conference, Seventh, Annual, Houston, Texas, May 5-8, 1975. p 523-533.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, Water pollution effects, *Oil spills, *Water pollution sources, Oil pollution, Winds, Movement, Fronts(Atmospheric), Tides, Dispersion, Gulf of Mexico, Offshore platforms, Model studies.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact, Oil slicks, Oil slick movement, Local wind direction.

The relative effect of local winds and near-surface currents in determining the movement of oil slicks in coastal and shelf waters was determined from 39 surveys by Raydist-equipped helicopters during the production platform Main Pass-41C spill off the Mississippi Delta in March 1970. Orientation of oil slicks is closely controlled by local wind direction; slicks usually form 10 deg to 40 deg to the right of the wind. Winds producing large, well-developed oil slicks are integrally related to easterly migrating high-pressure systems. Wind shifts associated with various sectors of migrating high-pressure cells quickly realign new slicks and actively dissapate old ones. Density fronts, both ambient and quasi-stationary, also play important roles in determining slick movement and size. Tides and tidal currents apparently played no significant role in movement or dispersion of the oil slicks. An easily utilized regression model for slick area and orientation as a function of wind velocity and local conditions is also presented. (Sinha - OEIS)
W76-09310

PROCEEDINGS OF JOINT CONFERENCE ON PREVENTION AND CONTROL OF OIL SPILLS, MARCH 13-15, 1973, WASHINGTON, D.C.,
American Petroleum Inst., Washington, D. C.
For primary bibliographic entry see Field 5B.
W76-09312

A SALT MARSH MICROCOSM: AN EXPERIMENTAL UNIT FOR MARINE POLLUTION STUDIES,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5C.
W76-09318

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 11-12, 1975, SAVANNAH, GEORGIA.
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
Report of Conference held at Savannah, Georgia, December 11-12, 1975. 93 p, January 1975.

Descriptors: *Environmental effects, *Resources development, Water resources, Coasts, *Continental Shelf, Estuaries, Beaches, Food processing industry, Recreation, Planning, Management, Offshore platforms, Drilling, Oil pollution, Economics, South Carolina, North Carolina, Georgia, Virginia, Florida.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact, Seafood processing.

The report on the Conference on Marine Resources of the Coastal Plains States is a compilation of eighteen papers. The purpose of the Conference was to serve as a means through

which Federal, State, and local government administrators, scientific researchers, and representatives from private industry, as well as private citizens, could address some of the major coastal and marine issues facing the Coastal Plains States. The Conference brought together leaders in marine fields from both inside and outside the Coastal Plains Region and having many different backgrounds and approaches to the problems addressed. These participants exchanged recent findings and ideas, and through the wider dissemination of this Report, much of this information is being made available to a much greater audience. Subjects covered in separate sections are: marine research and advisory capabilities; seafood processing; access to beaches and estuarine waters; Federal-State planning for marine fisheries; and offshore impacts of OCS development. Pertinent papers are abstracted and will be found distributed in the SWRA series. (See W76-09330 thru W76-09332) (Sinha-OEIS)
W76-09329

THE OCS FORGOTTEN LAND: TERRITORIAL SEA, NEARSHORE, AND ESTUARY,
Florida Dept. of Administration, Tallahassee. Div. of State Planning.
J. I. Jones.
In: Report of the Conference on Marine Resources of the Coastal Plains States, Savannah, Georgia, December 11-12, 1975. p 73-75, January 1975.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, *Water quality control, *Resources development, *Water pollution effects, Estuaries, Coasts, Coastal plains, Waste disposal, North Carolina, South Carolina, Georgia, Florida.
Identifiers: *Outer Continental Shelf, *Offshore technology, Territorial seas, Nearshore, Water pollution prevention.

The Southeastern States are gravely concerned about the environmental and other impacts which may impinge upon these areas as a result of OCS petroleum development activities. The unique geographic position occupied by the non-Federal OCS, occurring as it does between the OCS developmental activity and the shoreline, dictates a high level of interest and concern by the States. Its natural productivity, coupled with its environmental vulnerability and fragility are additional reasons for concern. Finally, its utilization as a recreational and fisheries resource, as well as a major area for waste disposal, provide legitimate reasons for a high level of State concern regarding this region. It should be emphasized that, in the National interest and for State needs and benefits, those States involved in the South Atlantic OCS leasing desire timely, orderly and well-considered development of the petroleum resource offshore their respective boundaries, there being no desire to hinder or delay such development. There is, however, the recognition that under present temporal and fiscal constraints the problem of impact evaluation of the non-Federal OCS is not being adequately addressed, and that this omission must be corrected through cooperative state and Federal action. (See also W76-09329) (Sinha-OEIS)
W76-09330

THE ROLE OF ENGINEERING IN MINIMIZING OFFSHORE IMPACTS,
Duke Univ., Durham, N. C. Dept. of Civil Engineering.
B. J. Muga.
In: Report of the Conference on Marine Resources of the Coastal Plains States, Savannah, Georgia, December 11-12, 1975. p 77-79, January 1975.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, *Resources development, Water pollution effects, Water quality control, Hazards, Safety, Land reclamation.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact, Water pollution prevention, Mooring, Offloading, Collisions.

The purpose of this presentation is to draw attention, by the use of several examples, to the question of how offshore impact can be minimized through creative engineering. This requires that one be very wary, and even skeptical, of both traditional and 'far out' engineering solutions because there is an advanced technology, developed within recent years at great expense, which is available and appropriate for ocean and nearshore applications. Several examples of both poor and beneficial developments, illustrating some aspects of this technology are shown. These examples indicate: how a land reclamation project can be undertaken which is compatible with the existing natural structures - in this case a coral reef; how recent developments in mooring and offloading systems can be utilized to minimize ship meetings, and therefore the risk of collision and resulting pollution; and how certain developments in new ship constructions and ship operations minimize further the risk of pollution from dirty ballast water. (See also W76-09329) (Sinha - OEIS)
W76-09331

OFFSHORE PETROLEUM DRILLING AND PRODUCTION,
Exxon Co., New Orleans, La. Southeastern Div.
R. R. Hickman.
In: Report of the Conference on Marine Resources of the Coastal Plains States, Savannah, Georgia, December 11-12, 1975. p 81-84, January 1975.

Descriptors: *Continental Shelf, *Environmentl effects, Water resources, *Resource development, *Water pollution effects, *Water quality control, *Fossil fuels , Water pollution sources, Operations, Safety, Regulations, Oil industry, Atlantic Ocean.
Identifiers: *Outer Continenental Shelf, *Offshore technology, Enironmental impact, Water pollution prevention.

The representative from the Exxon Company presents a brief history of offshore operations - explaining their scope and diversity, examines those areas on the Atlantic Outer Continental Shelf where the greatest potential hydrocarbon resources are thought to exist. Offshore petroleum operations are providing important energy supplies to the United States. The industry has been operating offshore for 27 years. More than 19,000 wells have been drilled and more than 6.5 million barrels of oil and 32.6 trillion cubic feet of gas have been produced. In all phases of this activity, including exploration, field development and production, environmental protection is a key consideration. Protective measures include personnel training, elaborate safety equipment, automatic controls, and back-up equipment. An overall good record of past performance offshore will be enhanced in the future by continuing technological improvement, by effective regulation, and by the industry's determination to protect the environment wherever it operates. (See also W76-09329) (Sinha - OEIS)
W76-09332

SIXTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 6-8, 1974, HOUSTON, TEXAS. PREPRINTS, VOLUME II,
Offshore Technology Conference, Dallas, Tex.
Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II, 1974. 1100 p, figs, tabs, refs.

Descriptors: *Continental Shelf, *Environmental effects, Water resources, Resources development, *Water pollution effects, Exploration, Exploitation, Oil pollution, Waves(Water), Offshore platforms, Drilling, Dredging, Nuclear powerplants, Engineering structures.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Environmental impact, Mooring.

The second volume is a collection of 92 papers prepared for presentation at the Sixth Annual Offshore Technology Conference held in Houston Texas, May 6-8, 1974. The Sponsor Societies for the Conference are the American Institute of Mining, Metallurgical, and Petroleum Engineers (Society of Mining Engineers,The Metalurgical Society and Society of Petroleum Engineers), American Association of Petroleum Geologists, American Institute of Chemical Engineers, American Society of Mechanical Engineers, American Society of Civil Engineers, Marine Technology Society, Society of Exploration Geophysicists, and Society of Naval Architects and Marine Engineers. Perinent papers are abstracted separately and will be found in the SWRA series. (See W76-09334 thru W76-09336) (Sinha - OEIS)
W76-09333

WATER POLLUTION ASPECTS FROM WASTE DRILLING MUD DISPOSAL IN CANADA'S ARCTIC,
Environmental Protection Service, Ottawa (Ontario).
W. J. Bryant, J. R. Goldburn, and S. E. Hrudey.
In: Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas, Preprints, Volume II, 1974. Paper No. OTC 2044, p 95-106, 6 fig, 2 tab, 10 ref.

Descriptors: *Water quality control, *Waste disposal, *Drilling fluids, Environmental effects, Water pollution sources, Fossil fuels, *Waste treatment, *Waste water disposal, Continental Shelf, Exploration, Waste water treatment, Resources development, *Canada, Arctic.
Identifiers: *Outer Continental Shelf, *Offshore technology, Petroleum, Hydrocarbons, Environmental impact, Beaufort Sea.

Current oil and gas exploration drilling in Canada's Arctic poses potential water pollution hazards to the sensitive environment of the north. Much of this drilling is now concentrated in low lying areas subject to flooding, such as the Mackenzie Delta, and in late 1973 drilling began in the shallow regions of the Beaufort Sea. This industrial activity can constitute a source of water pollution if drilling fluids are discharged to adjacent surface waters. A literature review has revealed little information on the water pollution characteristics of drilling fluids. In order to identify appropriate environmental controls, an industry/government research program was established in 1973 to determine the magnitude of the problem, and, as a result of these investigations, to develop effluent standards and guidelines for the disposal of waste drilling fluids. This paper describes the studies being conducted and highlights the results of the 1973 work. On the basis of the results obtained to date, indications are that water base drilling fluids constitute a wastewater with characteristics capable of causing water pollution. Furthermore, such wastes have been demonstrated to be acutely toxic to fish. (See also W76-09333) (Sinha - OEIS)
W76-09334

BEACH-OFFSHORE DREDGING: SOME ENVIRONMENTAL CONSEQUENCES,
London Univ. (England).
I. P. Jolliffe.
In: Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II, 1974. Paper No. OTC 2056, p 257-265, 5 fig, 22 ref.

Descriptors: *Dredging, *Environmental effects, Water resources, Resources development, *Water pollution effects, Channel improvement, Hydraulic mining, Coasts, Beaches, Navigation, Beach erosion.
Identifiers: *Outer Continental Shelf, *Offshore technology, Environmental impact, Beach nourishment.

Improving technology makes it possible to redistribute sediments in a fairly controlled manner to the overnall advantage of coastal users; for instance, in beach nourishment programs, in the transference of material from the accreting to the eroding flank of a harbor entrance, and in the maintenance dredging of a harbor-approach channel. In contrast, there are many instances in which sediments are deliberately removed from coastal systems, and are not necessarily being replaced; for example, in the removal of beach-nearshore material or material normally resident in the deeper water offshore, for industrial and other purposes. All dredging and dumping practices have some environmental consequences. If carried out without due regard for hydraulic and ecological consequences, serious repercusions may result. Coastal dredging generally falls into the following categories: beach-offshore dredging for beach nourishment, beach dredging for industrial purposes, nearshore-offshore dredging for navigational purposes, and offshore dredging for industrial purposes. (See also W76-09333) (Sinha - OEIS)
W76-09335

ENVIRONMENTAL STUDIES FOR MAJOR OFFSHORE DEVELOPMENTS,
Dames and Moore, New York.
J. M. Heckard, and D. L. Woodford.
In: Sixth Annual Offshore Technology Conference, May 6-8, 1974, Houston, Texas. Preprints, Volume II, 1974. Paper No OTC 2097, p 635-640, 4 ref.

Descriptors: *Environmental effects, *Oil spills, *Water pollution sources, *Water quality control, *Possil fuels, Resources development, Continental Shelf, Pollutants, Legislation, Evaluation.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Environmental impact, *Environmental design, Liquid natural gas, Site selection, Licensing.

Major offshore developments initiated or planned in recent years to ease the energy crisis include mono-buoys and docking islands for VLCCs and offshore nuclear power plants. Legislative requirements for environmental studies needed for licensing of such facilities is discussed as well as the scope of work needed for comprehensive environmental evaluations. Emphasis is placed on special considerations such as oil and LNG spills and movements, and dredging. Experience gained in ongoing studies will be of importance in planning similar projects. The objective of this paper is to address environmental conservation in light of new and major offshore developments. (See also W76-09333) (Sinha-OEIS)
W76-09336

SEPARATION PROCESSES USED FOR POLLUTION CONTROL IN THE PULP AND PAPER INDUSTRY,
Foundation of Canada Engineering Corp. Ltd., Halifax (Nova Scotia).
For primary bibliographic entry see Field 5D.
W76-09340

INTACT MANURE PACK HALTS SEEPAGE,
Ground Water Age, Vol. 10, No. 8, p 20, April, 1976. 1 fig.

Descriptors: *Pollution abatement, *Water pollution, Nitrates, Observation wells, Odor, Soil contamination, Seepage control, Farm wastes, Feed lots.
Identifiers: *Manure pact, *Feedlots, Colorado State Uniersity.

Agricultural Research Service soil scientists and agricultural engineer Harold R. Duke, in cooperation with Colorado State University, have shown that cattle feedlots do not pollute soil and ground water if there is an intact manure pack, and carrying capacity averages about one animal per two-hundred square feet. An intact manure pack essentially eliminated water infiltration and movement of contaminants through the soil to the ground water. Contamination was determined by analysis of nitrate nitrogen concentration found in ground water samples extracted from monitoring wells. (Gass-NWWA)
W76-09344

COUNTERMEASURES TO CONTROL OIL SPILLS IN WESTERN CANADA,
EBA Engineering Consultants Ltd., Edmonton (Alberta).
P. L. Hall, and H. Quam.
Ground Water, Vol. 14, No. 3, p 163-169, May-June 1976. 12 fig, 7 ref.

Descriptors: *Water pollution, *Water pollution sources, *Water pollution treatment, *Oil-water interfaces, Federal government, Local governments, Interagency cooperation, Legislation, Regulation, Administration, Industries, Education, *Canada, *Oil spills.
Identifiers: Environmental oil-leak detection, Government-industrial cooperation, Western Canada.

Increasing concern over ground-water pollution from hydrocarbons is being expressed by governments and industries in western Canada. The Manitoba government has recently held public hearings on the subject and is now working with the petroleum industry to develop new legislation concerning the handling of refined petroleum products. The petroleum industry has developed a series of 'oil spill manuals' which describe procedures for controlling leaks and spills of petroleum products. Emphasis is now being placed on education and prevention, and hydrogeologists are involved in developing training manuals and educational films. (Heiss-NWWA)
W76-09346

EPA STANDARDS FOR DRINKING WATER BECOME EFFECTIVE IN JUNE, 1977.
For primary bibliographic entry see Field 5F.
W76-09356

CATHODIC PROTECTION WELLS AND GROUND WATER POLLUTION,
California State Dept. of Water Resources, Sacramento.
E. A. Ritchie.
Ground Water, Vol. 14, No. 3, p 146-149, May-June, 1976. 3 fig, 5 ref.

Descriptors: *Cathodic protection, *Water pollution, *Hydraulic conductivity, Groundwater, Infiltration, Wells, California, *Corrosion.
Identifiers: *Cathodic protection wells, Contamination(Abandoned wells), Vertical sealing.

The cathodic protection well can endanger groundwater quality by providing a path for pollutants to reach usable water supplies. Cathodic protection wells alleviate electrolytic corrosion of pipelines, tanks and other installations situated in a corrosive environment. This is done by redirecting the current to a substitute anode which then deteriorates, instead of the structure being protected. Cathodic protection wells normally are from 100 to 500 feet in depth and 8 to 10 inches in diameter. To prevent cathodic protection wells from acting as conveyances for pollutants, they must be properly designed and constructed, and when their useful lives are over, properly destroyed. California has developed, and is implementing, standards covering these areas as part of its program for groundwater basin protection. (Heiss-NWWA)
W76-09357

MAKING THE WORLD SAFE FOR GROUND WATER,
For primary bibliographic entry see Field 5B.
W76-09360

SEVENTH ANNUAL OFFSHORE TECHNGLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME II.
Offshore Technology Conference, Dallas, Tex.
Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II, 1975. 921 p, figs, tabs, refs.

Descriptors: *Offshore platforms, *Environmental effects, Resources development, *Instrumentation, *Pipelines, *Water pollution sources, *Water quality control, Continental Shelf, Engineering structures, Harbors, Energy conversion, Buoys, Oil industry, Water resources, Waves(Water), Hurricanes, Geophysics, Currents(Water), Manganese, Cathodic protection.
Identifiers: *Outer Continental Shelf, *Offshore technology, Ocean thermal energy, Solar energy, Energy sources, Offshore generating systems, North Sea, Batteries, Submersibles, Semisubmersibles, Nodules.

The second volume contains papers OTC 2245 to OTC 2335 of the proceedings of the Seventh annual Offshore Technology Conference held May 5-8, 1975 at Houston, Texas. The Sponsor societies for the Conference are the American Institute of Mining, Metallurgical and Petroleum Engineers (Society of Mining Engineers, The Metallurgical Society and Society of Petroleum Engineers), American Association of Petroleum Geologists, American Institute of Chemical Engineers, American Society of Mechanical Engineers, American Society of Civil Engineers, Institute of Electrical and Electronic Engineers, Marine Technology Society, Society of Exploration Geophysicists, and Society of Naval Architects and Marine Engineers. Pertinent papers are abstracted separately and will be found in the SWRA series. (See also W76-09372 thru W76-09373) (Sinha - OEIS)
W76-09371

DEVELOPMENT OF A WATER QUALITY INSTRUMENTATION PACKAGE FOR LONG-TERM OPERATION FROM BUOYS AND OTHER UNATTENDED MARINE PLATFORMS,
National Marine Fisheries Service, Washington, D.C. Data Buoy Office.
W. B. Waff, P. A. Wolfgram, and J. P. Rohling.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975. Houston, Texas. Preprints, Volume II, 1975. No. OTC 2299, p 529-536, 10 fig.

Descriptors: *Fouling, *Environmental effects, *Water quality control, Resources development, *Offshore platforms, *Buoys, *Oil pollution, *Water pollution, *Instrumentation, Continental Shelf, Toxicity.
Identifiers: *Outer Continental Shelf, *Offshore technology, Transducers.

Development of an instrumentation package to measure gross water parameters from buoy and other unattended marine platforms is discussed. Parameters measured are dissolved oxygen, conductivity, chlorophyll, pH, turbidity, and temperature. Off-the-shelf transducers were integrated into a prototype system with emphasis during development centered on the problems of limited power, reliability, and marine fouling. The approach and solutions to these problems are discussed including lab and field test results of antifoulants. The conclusion reached from the field testing is than an antifoulant must be tailored to the specific life goals of a system. The toxin release rate must be rapid enough to provide the degree of fouling retardation required; however, the release rate must be paced so that the life of the antifoulant is compatible with the life goals of the system. A compromise between these conflicting factors must be reached. In addition increasing the toxin concentration in the water near the sensitive transducer areas by increasing the adjacent

surface areas that may be covered with antifoulants should aid in retarding fouling. (See also W76-09371) (Sinha - OEIS)
W76-09372

ON THE RISK ASSESSMENT OF OFFSHORE STRUCTURES,
Technische Hochschule, Munich (West Germany).
G. I. Schueller.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume II, 1975. No OTC 2334, p 903-908, 4 fig, 10 ref.

Descriptors: *Offshore platforms, Engineering structures, *Water quality control, Resources development, *Environmental effects, Hurricanes, Continental Shelf, Storm surge, Waves(Water), Design criteria, Assessments, *Risks, Estimating.
Identifiers: *Outer Continental Shelf, *Offshore technology, Wave heights.

A reliability approach for the selection of design criteria of rigid fixed offshore platforms under wave actions is presented. Severe storm occurrence probabilities using the uniform Poisson process are calculated. The load intensity is described by the distribution of wave heights generated by severe storms. The estimated design life and the reliability required can be used as input parameter of the model. The procedure outlined in this paper recognizes the uncertainties under which design decisions for rigid fixed offshore platforms have to be made. The method takes into account the stochastic nature of storm occurrences as well as the statistical distribution of wave heights generated by these storms. The reliability function as defined by Freudenthal et al is used as a risk criterion. The advantage of the method is the possibility of linking the design life and the design wave height to the risk the engineer encounters by selecting two of the parameters. The concept is versatile with respect to the selection of different stochastic storm occurrence models and the statistical distribution of the load intensities for various sites. The method can be adapted to a non-deterministic wave height - wave force relationship easily. (See also W76-09371) (Sinha - OEIS)
W76-09373

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME III.
Offshore Technology Conference, Dallas, Tex.
Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. 878 p, fig, tabs, refs.

Descriptors: *Environmental effects, *Offshore platforms, Resources development, Water resources, *Water quality control, *Oil spills, *Oil pollution, Continental Shelf, Engineering structures, Exploration, Exploitation, Harbors, Coasts, New Jersey, Virginia, Islands, Navigation.
Identifiers: *Outer Continental Shelf, *Offshore technology, Artificial islands, Superports, Port Islands, Industrial ports.

The third volume contains papers OTC 2336 to OTC 2431 of the proceedings of the Seventh annual Offshore Technology Conference held May 5-8, 1975 at Houston, Texas. The Sponsor societies for the Conference are the American Institute of Mining, Metallurgical and Petroleum Engineers (Society of Mining Engineers, The Metallurgical Society and Society of Petroleum Engineers), American Association of Petroleum Geologists, American Institute of Chemical Engineers, American Society of Mechanical Engineers, Marine Technology Society, Society of Exploration Geophysicists, and Society of Naval Architects and Marine Engineers. Pertinent papers are abstracted separately and will be found in the SWRA series. (See also W76-09375 thru W76-09388) (Sinha - OEIS)
W76-09374

EVALUATION OF MULTI-PURPOSE INDUSTRIAL-PORT ISLANDS: SEA ISLAND STRUCTURE ENGINEERING RESEARCH STUDY,
Harris (Frederick R.), Inc., New York.
J. Bonasia.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2336, p 9-21, 4 fig, 13 ref.

Descriptors: *Environmental effects, *Offshore platforms, Resources development, Water resources, Water quality control, *Oil spills, *Oil pollution, Continental Shelf, Engineering structures, Exploration, Harbors, Coasts, New Jersey, Virginia, Islands, Navigation.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artificial islands, *Superports, Port Islands, Industrial ports.

A research program was initiated by the National Science Foundation's Research Applied to National Needs Program to evaluate the economic, engineering, legal and environmental feasibility of artificial, manmade industrial/port islands located off the U.S. Atlantic and Gulf Coasts. The Civil Engineering considerations of the study included an examination of site selection factors, (foundations, geology, bathymetry, currents, etc.), design factors, (hurricanes, ship collision, sea defense design, etc.), operational and layout factors, (industrial layout, harbor facilities, storage areas, etc.), and construction technology (equipment, source of fill material, costs, etc.). The study concluded that a manmade multi-purpose offshore industrial port/island is technically feasible to construct ten to eleven nautical miles off either the New Jersey or Virginia coasts. The island facilities would be designed to incorporate all pollution prevention and control measures for each industry requiring such measures. Petroleum tankers, both crude and product, would be boomed during loading and discharge. In addition, contingency plans could possibly provide for booming the harbor entrance and exit in the event of an oil spill to prevent oil from escaping outside the harbor. (See also W76-09374) (Sinha - OEIS)
W76-09375

OFFSHORE MULTI-USE PORT ISLANDS AND THEIR ENVIRONMENT,
Delaware Univ., Newark.
L. Watling.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2337 p 23-37, 2 tab, 64 ref.

Descriptors: *Environmental effects, Resources development, Water resources, *Offshore platforms, *Water quality control, *Water pollution sources, *Oil pollution, Continental Shelf, Engineering structures, Ecosystems, Primary productivity, Metals, Monitoring.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artificial islands, *Port islands, *Superports, Biological effects, Substratum.

Environmental problems associated with the construction and operation of an off-shore multi-use island have been considered. Environmental Protection Agency proposed water quality criteria were reviewed. Other aspects of the oceanic environment not covered by the EPA criteria are discussed and recommended criteria given. These include: sound, salinity, temperature, light penetration, turbidity, substratus, and ecosystem dynamics. The impact of the construction and maintenance of an island meeting these criteria is not discussed. No recommendation concerning the effects of island construction and operation on ecosystem dynamics can be made at this time. However, it is strongly recommended that a model be developed for the ecosystem in the vicinity of a proposed island site and that this model be used to monitor changes in the system during constuction and subsequent operation of the island. (See also W76-09374) (Sinha - OEIS)
W76-09376

INDUSTRY CANDIDATES AND GENERAL LOCATIONS FOR ARTIFICIAL INDUSTRIAL-PORT ISLANDS,
Texas A and M. Univ., College Station.
D. M. Bragg, N. C. Whitehorn, and B. G. Schmidt.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 175. No. OTC 2338. p 36-47, 5 fig.

Descriptors: *Water quality control, Resources development, Water resources, *Environmental effects, Offshore platforms, Continental Shelf, Islands, Power plants, Design criteria, Industrial plants.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artificial islands, *Port islands, Industrial port islands.

Recent problems encountered by energy-conversion and raw material-reduction industries in obtaining plant sites in coastal regions of the United States have adversely affected programs designed to increase this country's electric-generating and oil-refining capabilities. At the same time that demand for refined petroleum, electric power and other energy forms is at near-record levels, restrictive legislation in many states has cast doubts as to our ability to satisfy this demand in future years. Offshore artificial islands could very well provide relief for some of the growing pains presently being endured by many segments of industry. The heat sink needs of power generating, the impact of refinery emissions on nearby areas, and the real or imagined hazards of nuclear power plants could all be relieved if these installations were located on artificial islands placed some distance offshore. In addition, deepwater ports could be established adjacent to bulk-using operations such as steel mills and phosphate fertilizer plants without the necessity for dredging deep channels through estuarine environments. Artificial islands offshore could become a viable solution,especially in the middle Atlantic region where the problem is most severe. (See also W76-09374) (Sinha - OEIS)
W76-09377

ADAPTING INDUSTRIAL PROCESSES FOR MULTI-PURPOSE INDUSTRIAL PORT ISLANDS,
Gilbert Associates, Inc., Reading, Pa.
B. Yeich.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975 No OTC 2339. p 51-63, 4 fig, 5 tab, 5 ref.

Descriptors: *Water quality control, *Resources development, *Water resources, *Environmental effects, Offshore platforms, Continental Shelf, Islands, Power plants, Design criteria, Industrial plants.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artificial islands, *Port islands, Industrial port islands, Heat sinks.

The objectives of the process description and adaptation study were to quantitatively describe an example industrial complex in terms of those variables that effect the design of the island, to investigate the concept of industry integration as a means f optimizing an off-shore island as a site for the industry tenants , and to identify areas in which new technology developments would enhance the offshore island as a site for industry tenants. The report describes the processes that would most likely be incorporated by each candidate industry, describes, as an example, one scheme of process integration for the candidate industries, and identifies promising areas of

research and development that would improve the adaptability of industrial processes to an off-shore island site. The island would be removed from land that may have alternative uses related to human habitation, recreation, or environmental conservation. A man-made island presents the opportunity to structure the site so as to maximize use of the air and sea within the limits of environmental acceptability. For example, it would appear that the ocean around a man-made island could be used as a heat sink with minimum impact on established wild-life habitats. The coincidental existence of an industrial complex, deep water terminal, and absence of threatened coastal habitats may provide a unique degree of freedom in integrating processes. (See also W76-09374) (Sinha - OEIS)
W76-09378

EVALUATION OF SEISMICITY AND EARTHQUAKE SHAKING AT OFFSHORE SITES,
Geological Survey, Anchorage, Alaska.
R. A. Page.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2354. p 179-190, 9 fig, 11 ref.

Descriptors: *Seismic studies, *Offshore platforms, *Oil pollution, *Seismic design, *Water quality control, *Environmental effects, Resources development, Water pollution sources, Continental Shelf, *Earthquakes, Engineering structures, Alaska, Evaluation.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Gulf of Alaska.

Many new continental shelf areas bordering the United States are being considered for oil and gas lease sales. Among the areas under consideration are several along the Pacific Coast that are characterized by high levels of earthquake activity. Successful development of petroleum and other mineral resources in such areas requires that earthquake hazards in the offshore environment be carefully assessed and that fixed offshore structures be designed to resist earthquakes and related geologic and hydrologic effects. Information concerning the probable location and magnitude of future earthquakes, the probability of surface faulting, the expected nature of ground shaking, the likelihood of ground failure such as liquefaction and sliding, and the probability of a tsunami are needed. This paper discusses various methods and techniques used to evaluate seismicity and ground shaking at offshore sites. The discussion is illustrated with examples from the continental shelf area in the Gulf of Alaska which is characterized by frequent earthquakes in the magnitude 8 range. Among the hazards to be considered are severe ground shaking, tsunamis, sudden faulting of the sea floor and earthquake-induced ground failure, including submarine slides and turbidity current flows. (See also W76-09374) (Sinha - OEIS)
W76-09379

ENVIRONMENTAL SITE ASSESSMENT FOR A MASSACHUSETTS BAY DEEPWATER OIL TERMINAL,
Raytheon Oceanographic and Environmental Services, Bedford, Mass.
G. V. Cox.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2382. p 471-488, 5 fig, 8 tab, 6 ref.

Descriptors: *Environmental effects, Resource developments, Water resources, Water quality control, Water pollution sources, *Ports, Assessments, Continental Shelf, Islands, Fisheries, Navigation, Massachusetts.
Identifiers: *Outer Continental Shelf, *Offshore technology, *Artifical islands, *Deepwater oil terminals, Superports, Port islands, Site selection, Biological effects, *Massachusetts Bay.

The selection of candidate deepwater petroleum terminal sites from an area bounded by Boston Harbor on the south and the New Hampshire border on the north was the object of this investigation. Four zones in the study area were defined, and one site in each area was selected for environmental evaluation. Three additional sites further offshore were also included. Sites have been ranked on the basis of available information and recommendations for ancillary actions have been made. Consideration is given to the following aspects in site selection; meteorology; waves; currents; living resources; and navigation. The study objectives include identifying areas off the Massachusetts coast which can be utilized for deepwater port operations, defining areas which provide the best balance between least risk and least cost, and determining what type of deepwater port terminal design can be employed to provide best availability and least environmental impact. (See also W76-09374) (Sinha - OEIS)
W76-09380

MASS TRANSPORT AND DISPERSION OFF A TIDAL INLET,
Tetra Tech, Inc., Pasadena, Calif.
C. J. Sonu, and L. D. Wright.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2383. p 489-498, 10 fig, 6 ref.

Descriptors: Water pollution sources, Pollutants, *Tidal effects, *Environmental effects, Resources development, Water resources, Continental Shelf, Inlets(Waterways), Land breezes, Sea breezes, *Dispersion, Diffusion, Florida, Lagoons, Jetties, Gulf of Mexico.
Identifiers: *Outer Continental Shelf, Longshore currents, *Mass transport.

A field study was undertaken in order to investigate the interplay among tide, water density distribution, longshore currents, waves and winds associated with a tidal inlet. The study site was East Pass, located at the eastern end of Santa Rosa Island adjacent to Destin, Florida. East Pass connects the Gulf of Mexico with the Choctawhatchee Bay, a hypopycnal lagoon with a surface area of approximately 138 square miles with water depths generally less than 3 m. Pollutants moving with undiluted offshore water can approach a tidal inlet for most part of the tidal cycle. During flooding tide, a wave-induced longshore current arriving from the adjacent surf zone is readily entrained into the inlet, whereas an ambient cross current, either driven by tide or sea breeze, tends to bypass the inlet by deflecting seaward at the jetty. During ebb tide, these currents can still operate in strength in the underlayer, by-passing the inlet beneath the buoyant jet or approaching the inlet under a laterally expanding effluent along the adjacent surf zone. The effluent discharging with the jet can undergo strong buoyant expansion into the adjacent coast, forming a partially diluted effluent pool against the shore under a sea breeze. The land breeze and the instability at the density boundary between this nearshore effluent pool and the undiluted offshore water are the two most important factors affecting the eventual dispersion and diffusion of the tidal inlet effluent. (See also W76-09374) (Sinha - OEIS)
W76-09381

THE OFFSHORE ECOLOGY INVESTIGATION,
Gulf Universities Research Consortium, Gulfport, Miss.
J. M. Sharp, and J. W. Tyson.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2384. p 499-504.

Descriptors: *Ecology, *Oil pollution, *Fossil fuels, *Environmental effects, Water quality control, *Ecosystems, Assessments, Continental Shelf, Offshore platforms, Resources development, Water resources, Louisiana, Drilling, Production, Louisiana, Bays.
Identifiers: *Outer Continental Shelf, *Offshore technology, Water pollution prevention, Environmental impact, Timbalier Bay(LA).

The Offshore Ecology Investigation (OEI) was initiated to assess the environmental/ecological impact of petroleum drilling and production off the coast of Louisiana. During the past two years, eight synoptic field sampling and data collecting exercises were completed in Timbalier Bay, Louisiana and offshore to a depth of about 100 feet. The collective investigations are directed to the determination of the possible effects of petroleum drilling and production on these estuarine and continental shelf ecosystems. Comparisons are made between (1) the shallow water bay system and the adjoining near-shore shelf region and (2) plaform locations experiencing prolonged intensive production and both nearby and distant control locations having experienced no drilling or production activity thus far. Seventy-nine percent of the investigations demonstrated either no harmful impact or abeneficial impact and 21 percent of the investigations required further interpretation but did not demonstrate harmful impact. The need for further interpretation arises from one or more of several reasons: insufficient data; internally inconsistent results reported; data reported by others; or the reporting mechanism did not provide sufficient information to allow a decision. It would seem from the evidence provided that no harmful impact on the environment from production or drilling is demonstrated. (See also W76-09374) (Sinha - OEIS)
W76-09382

NEW YORK ALTERNATIVE DUMPSITE ASSESSMENT - RECONNAISSANCE STUDY OF SURFICIAL SEDIMENTS,
National Oceanic and Atmospheric Administration, New York. Marine Ecosystems Analysis Program.
G. L. Freeland, and D. J. P. Swift.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2385. p 505-511, 6 fig, 6 ref.

Descriptors: *Waste disposal, *Water pollution sources, Resources development, *Environmental effects, Water resources, Sediments, *Sediment transport, Continental Shelf, New York, Sewage sludge, Sewage disposal, Sludge disposal, Evaluation.
Identifiers: *Outer Continental Shelf, *Ocean dumping, *Dumpsites, New York Harbor, New York Bight, Environmental Impact.

Preliminary evaluation of the potential for deposition of dumped materials, primarily sewage sludge, were made at two sites 60 nm from New York Harbor in 20 to 30 fm water depths. Since sludge particle density is barely over 1.0, geological data were analysed for potential deposition and transport of fines in particular in addition to the sand-sized fraction. Results suggest a net southwestward bottom sediment transport, intensifying during winter storms. Both dumpsites are floored by sand, predominately medium-grained (0.25 to 0.5 mm). At the northern dumpsite, moderate sediment transport is indicated to the south and west over a gently sloping bottom incised by broad, low-gradient, pre-existing valleys. Evidence of more active sediment transport to the southwest is indicated at the southern dumpsite. (See also W76-09374) (Sinha - OEIS)
W76-09383

HYDROCARBONS IN WATER AND SEDIMENT SAMPLES FROM COAL OIL POINT AREA, OFFSHORE CALIFORNIA,
Exxon Production Research Co., Linden, N.J.
For primary bibliographic entry see Field 5B.
W76-09384

INFLUX OF PETROLEUM HYDROCARBONS INTO THE OCEAN,
Coast Guard, Washington, D. C.
C. C. Bates, and E. Pearson.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2390. p 535-544, 4 tab, 27 ref.

Descriptors: *Oil pollution, *Environmental effects, *Oil spills, Resources development, Water resources, *Water pollution sources, Continental Shelf, Monitoring, Seepage, Exploration, Exploitation, United Nations, Oceans, Organic compounds, *Path of pollutants.
Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, Natural seepage, Earthwatch, Global monitoring, World Ocean.

Four definitive studies have been published in the past five years regarding the influx of petroleum hydrocarbons (PHC) into the world ocean. The first three studies--those by the Massachusetts Institute of Technology (1970), University of Oklahoma (1973), and the U.S. Coast Guard (1973)--omitted the contribution of PHC from natural seepage, coastal municipal wastes, and direct urban runoff outside the riverine systems. The fourth study by a National Academy of Sciences Panel (1975) now includes these factors and concludes that approximately 6.1 million metric tons of PHC--or about 0.25% of that produced--entered the ocean annually in the 1971-1972 time frame. Major PHC sources were calculated to be: Marine Transport-33%; river run-off-27%; coastal activities-18%; atmospheric fallout-10%; natural seeps-10%; and offshore petroleum production-2%. A definite need exists to proceed with the United Nations 'Earthwatch' effort relative to systematic and standardized monitoring globally of marine pollution by PHC in order to resolve the many unknowns still existing in regards to the inputs, fates, and effects of hydrocarbons in the marine environment. (See also W76-09374) (Sinha - OEIS)
W76-09385

GEOTECHNICAL ASPECTS OF ROCK BORROW FOR LARGE BREAKWATERS,
Dames and Moore, New York.
I. Watson, J. A. Fischer, and C. M. Urlich.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2392. p 553-563, 2 fig, 2 tab, 9 ref.

Descriptors: Powerplants, *Nuclear powerplants, *Breakwaters, Engineering structures, Environmental effects, Resources development, Water resources, *Water pollution sources, *Water quality control, Continental Shelf, Rocks, United States, Atlantic Ocean, Gulf of Mexico.
Identifiers: *Outer Continental Shelf, *Floating powerplants, Offshore powerplants, *Offshore technology, *Rock borrow, Rockfill breakwaters, U.S.East Coast, Gulf Coast.

A state of the art of investigations to secure rock borrow for the breakwaters proposed to protect offshore nuclear power plants is presented. Considerations relating to the geological, geotechnical, and design suitability of rock are discussed within the framework of economics, and the environmental impact of quarrying and transporting rock to potential sites on the East and Gulf coasts of the U.S. The methodology outlined has application to the construction of all large rockfill breakwaters. The selection of suitable sources of rock borrow for the construction of breakwaters to protect floating nuclear power plants or other important offshore structures should be based on intensive investigations. These should be undertaken well in advance of finalizing the breakwater design. Although the quantities of rock for floating nuclear power plants breakwaters are not large in comparison with certain earth/rockfill dams, the requirements on quality in terms of the safety criteria specified by the Atomic Energy Commission are stringent. (See also W76-09374) (Sinha - OEIS)
W76-09386

EVALUATION OF OFFSHORE BREAKWATER STABILITY UNDER WAVE ACTION,
Dames and Moore, New York.
J. A. Fischer, and B. T. D. Lu.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2394. p 577-590, 4 fig, 38 ref.

Descriptors: Powerplants, *Nuclear powerplants, *Breakwaters, Engineering structures, Environmental effects, Resources development, *Soil strength, Water resources, Water pollution sources, *Water quality control, Continental Shelf, Rocks, Stability, Storm surge, Waves(Water), Foundation investigations, Soils, United States.
Identifiers: *Outer Continental Shelf, *Floating powerplants, *Offshore powerplants, *Offshore technology, Rock borrow, Rockfill breakwaters, U.S. East Coast, Gulf Coast, *Wave action.

Attacking storm waves affect the overall design of any offshore breakwater used as a protective structure. Methods and considerations required to evaluate the stability of an offshore breakwater under design storm wave action is described. The following various storm wave effects are of concern: the possibility of wave forces physically causing damage to the breakwater embankment materials; the stability of the breakwater against horizontal sliding; the stability of the breakwater embankment against slope failure; and the effect of continuing storm waves on the strength and stability of the foundation soils. The characteristics of wave and breakwater configuration must be considered in determining the design magnitudes of breaking wave force and hydrostatic pressure acting on the breakwater. In addition, the rapid drawdown conditions of the water level as the wave retreats outside the breakwater may be critical and should be considered in the analyses. Both wedge and conventional circular failure types of stability analyses should be utilized in analyzing the slope stability of an offshore breakwater. The procedures described are part of the necessary stability considerations in the design of a breakwater to protect a floating nuclear generating plant (FNP), and are also applicable to the design of any important offshore breakwater or gravity structure. (See also W76-09374) (Sinha - OEIS)
W76-09387

EFFECT OF OFFSHORE STRUCTURES ON SHORELINE EVOLUTION, ATLANTIC GENERATING STATION,
Army Engineers Waterways Experiment Station, Vicksburg, Miss.
R. W. Whalin, R. D. Carver, and D. D. Davidson.
In: Seventh Annual Offshore Technology Conference, May 5-8, 1975, Houston, Texas. Preprints, Volume III, 1975. No. OTC 2431, p 873-886, 7 fig, 2 tab, 5 ref.

Descriptors: Powerplants, *Nuclear powerplants, *Breakwaters, Engineering structures, *Environmental effects, Resources development, Water resources, Water pollution sources, *Water quality control, Continental Shelf, Stability, Models, Waves(Water), Currents(Water), Erosion, Beaches, New Jersey.
Identifiers: *Outer Continental Shelf, *Floating powerplants, *Offshore powerplants, *Offshore technology, *Wave action, Shoreline evolution, Longshore currents, Breaker zone, Nearshore, Accretion, Environmental impact.

A distorted scale hydraulic model investigation was performed to determine the potential effect, if any, of a proposed offshore nuclear power plant on shoreline evolution. Model measurements of current patterns and breaking wave characteristics (height, depth and angle to shoreline) were used to calculate longshore transport rates in the potentially affected areas. It appears that construction of the proposed offshore nuclear powerplant and breakwater will not significantly alter current patterns within the breaker zone, significantly alter longshore current velocities or transport rates north and south of the inlet, and have a significant effect on shoreline evolution in the area under consideration. The distorted scale model provided adequate information to make the conclusions set forth in this investigation which are that the proposed construction would have a negligible effect on future shoreline evolution. (See also W76-09374) (Sinha - OEIS)
W76-09388

SELF-PURIFICATION OF SMALL FRESH-WATER STREAMS: PHOSPHATE, NITRATE, AND AMMONIA REMOVAL,
Department of Scientific and Industrial Research, Taupo (New Zealand). Ecology Div.; and Department of Scientific and Industrial Research, Taupo (New Zealand). Freshwater Section.
R. H. S. McColl.
N Z J Mar Freshwater Res. 8(2), p 375-388, 1974.

Descriptors: *Self purification, *Phosphates, *Nitrates, *Ammonia, Nutrients, Absorption, Algae, Photosynthesis, StreaM, Effluents, Temperature, Sediments.

Uptake of stream nutrients by organisms or sediments of the stream bed is affected by the nutrient loading to which the stream is accustomed. In a stream with nutrient-poor waters, added phosphate and ammonia were removed rapidly and efficiently at water temperatures within the range 4.5-15.0C on passing over a mat of filamentous algae and trapped sediment. Nitrate was removed less efficiently or not at all. In another stream where nutrients were abundant phosphate and nitrate from a sewage outfall were not significantly removed by the stream bed flora up to 100 m downstream at summer temperatures. Na was used as an inert marker to measure the dilution of added nutrients or sewage effluent by the stream waters; electrical conductivity was rejected as a measure because it is influenced by photosynthesis. Studies of nutrient run-off should take account of stream-bed removal when the effects of run-off on eutrophication of lakes are being considered.--Copyright 1975, Biological Abstracts, Inc.
W76-09398

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AGRICULTURAL WATER DEMANDS IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-08841

MODELS FOR EVALUATION OF FRESH-WATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 4A.
W76-08921

MOUNTAINOUS WINTER PRECIPITATION: A STOCHASTIC EVENT-BASED APPROACH,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2B.
W76-09062

6B. Evaluation Process

RECREATION USE PATTERNS AND USER ATTITUDES ON THE SNAKE RIVER,
Washington State Univ., Pullman. Dept. of Forestry and Range Management.
R. L. Shew, and M. P. Werner.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 768, $5.50 in paper copy, $2.25 in microfiche. Washington Water Research Center, Pullman, Completion Report, March 1976. 114 p, 4 fig, 25 tab, 56 ref, 6 append. OWRT A-050-WASH(1) 14-31-0001-3848.

Descriptors: Recreation, *Attitudes, Planning, Land use, *Recreation demand, Social needs, Economics, Idaho, *Washington.
Identifiers: *Snake River(Wash).

The Snake River, in its natural state, has provided various types of recreation opportunities to both local residents and visitors. The conversion of the free-flowing river to slackwater impoundments behind a chain of dams and their associated developments will undoubtedly have an impact on the recreation use patterns in the area and the types of recreation user groups attracted to the area. The main objectives of the study were to: (1) conduct a base study on the recreation users and uses; (2) gather socioeconomic data pertaining to the recreation users of the Snake River Canyon within the study area; (3) determine the recreational activities and use patterns within the defined study area; (4) identify and describe the types of recreation users in the area based on their attitudes towards recreation; and (5) correlate the activities and use patterns with the socioeconomic data. Eighteen recreation activities were identified. The recreationists were predominately young to middle aged and more highly educated than the national average. The percentage of persons recreating alone was also higher than the national average, and the study showed higher percentages for groups of friends on a recreation outing and lower percentages for families as compared to national statistics. The total use figure produced by the study was 85,871 visitor days. Results showed that a diversity of recreation opportunities existed in this area before impoundment, and along with this diversity were certain environmental elements which appealed to recreationists. Proper diversity of recreation areas can be maintained by encouraging development and use which complements rather than competes for similar recreation opportunities. This diversity is one of the key elements to recreation enjoyment by a variety of recreation user groups. This principle should be observed in the planning efforts of agencies which are genuinely concerned about recreation in the area.
W76-08751

USER CHARGES FOR INLAND WATERWAYS: A REVIEW OF ISSUES IN POLICY AND ECONOMIC IMPACT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4A.
W76-08847

MODELS FOR EVALUATION OF FRESHWATER WETLANDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 4A.
W76-08921

METHODS OF ESTIMATING RESIDENTIAL LAND USE FOR WATER RESOURCES MANAGEMENT,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Economics.
For primary bibliographic entry see Field 4C.
W76-08924

IMPACT OF CHANGES IN IRRIGATION WATER MANAGEMENT IN EASTERN IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3F.
W76-08925

INDUSTRIAL DEVELOPMENT THROUGH WATER-RESOURCES PLANNING,
Department of Commerce, Washington, D. C.
For primary bibliographic entry see Field 3E.
W76-09034

WATER RESOURCES POLICY ISSUES - 1975.
Oregon State Univ., Corvallis. Water Resources Research Inst.
SEMIN WR 020-75, July 1975. 96 p.

Descriptors: *Water resources development, *Water policy, *Federal government, Costs, Cost repayment, Legislation, Cost sharing, Inland waterways, Flood control, Irrigation programs, Local governments, Water quality, Water pollution control, Pacific Northwest U.S., Electric power production, Washington, Oregon, River flow, Columbia River, Institutional constraints.
Identifiers: Zero discharge, Snake River(Wash).

Historically the federal government's policy has been to assume all or a considerable portion of the costs for water resources development. The National Water Commission's report of 1973 made sweeping changes in these policies by requiring non-federal interests to bear an appropriate share of costs. The Commission also concluded that the 'zero discharge' goal is impractical and unattainable. The review by Congress of the Water Resources Council's definition of the federal water policy as stated in its 'Principles and Standards' poses the question whether the policy of the federal government is to encourage or discourage water resource development. How these policies affect the Pacific Northwest in relation to power development, marketing and revenues; river flows, pollution, and state institutions were considered in this seminar. Specific contributions deal with energy generation in the Western States, water requirements for energy production, pollution from non-point sources and its control, protection of fish habitats in forest lands, interstate water diversion, protection of wild rivers, water conservation in irrigated agriculture, and the future availability of water and its impact on food production demands. (See W76-09231 thru W76-09237) (Auen-Wisconsin).
W76-09230

WATER REQUIREMENTS FOR ENERGY,
For primary bibliographic entry see Field 3E.
W76-09231

POLLUTION FROM NON-POINT SOURCES,
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5B.
W76-09232

FISH HABITAT IN FOREST LANDS,
Pacific Northwest Forest and Range Experiment Station, Corvallis, Oreg. Forestry Sciences Lab.
For primary bibliographic entry see Field 8I.
W76-09233

WATER DIVERSION AND THE MORATORIUM,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 4A.
W76-09234

PROTECTION OF FREE-FLOWING RIVERS,
Oregon State Univ., Corvallis. Dept. of Geography.
For primary bibliographic entry see Field 6E.
W76-09235

WATER CONSERVATION AND IRRIGATED AGRICULTURE,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-09236

WATER AND FOOD PRODUCTION DEMANDS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 6D.
W76-09237

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

USER CHARGES FOR INLAND WATERWAYS: A REVIEW OF ISSUES IN POLICY AND ECONOMIC IMPACT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4A.
W76-08847

COSTS OF BIOLOGICAL WASTE WATER PURIFICATION (DIE KOSTEN DER BIOLOGISCHEN ABWASSERREINIGUNG),
For primary bibliographic entry see Field 5D.
W76-09016

COST OF PRODUCING CROPS IN THE IRRIGATED SOUTHWEST, PART V: UTAH,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 3F.
W76-09063

PROCESSES MAKE SEWAGE COME CLEAN MORE CHEAPLY.
For primary bibliographic entry see Field 5D.
W76-09154

MONOGRAPH OF THE EFFECTIVENESS AND COST OF WATER TREATMENT PROCESSES FOR REMOVAL OF SPECIFIC CONTAMINANTS. VOL. 1. TECHNICAL MANUAL,
Volkert (David) and Associates, Bethesda, Md.
For primary bibliographic entry see Field 5F.
W76-09227

CAPABILITIES AND COSTS OF TECHNOLOGY ASSOCIATED WITH THE ACHIEVEMENT OF THE REQUIREMENTS AND GOALS OF THE FWPCA OF 1972 FOR PULP AND PAPER INDUSTRY.
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 5G.
W76-09229

WATER CONSERVATION AND IRRIGATED AGRICULTURE,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W76-09236

PRIVATE WELLS PROVE TO BE A BETTER BUY,
For primary bibliographic entry see Field 4B.
W76-09343

COST ESTIMATION.
For primary bibliographic entry see Field 4B.
W76-09354

6D. Water Demand

AGRICULTURAL WATER DEMANDS IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W76-08841

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN SELECTED COAL-ENERGY AREAS OF UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 4B.
W76-09148

WATER RESOURCES POLICY ISSUES - 1975.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W76-09230

WATER REQUIREMENTS FOR ENERGY,
For primary bibliographic entry see Field 3E.
W76-09231

WATER AND FOOD PRODUCTION DEMANDS,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p 81-93. 3 fig, 6 tab.

Descriptors: *Agriculture, *Irrigation, *Water supply, Water demand, Energy, Soil-water-plant relationships.
Identifiers: Food production, Energy requirements.

The importance of water for food production is considered in relation to the availability of fresh water and its place of occurrence. Of the earth's 32 billion acres of land, only 25%, or 8 billion acres, are suitable for cultivated crops, with only about 14% of the farmland in irrigation. Most of the land where crops can be economically grown without supplemental irrigation are now in use. The food energy yield from corn grain resulting from the input of cultural energy is substantially smaller under irrigated conditions than under non-irrigated production. The ratio of energy yield to energy input has decreased to about 2.2. The expansion of irrigated agriculture is feasible on a small scale but appears questionable on a large scale because of the high energy requirement. Mankind may learn to use the food energy available in a more efficient manner and not discharge much of the crop energy as waste. Recycling systems that include the use of textured vegetable proteins can be visualized. The present economic unfeasibility of desalination of oceanic water for agriculture may be reversed by developments in applying solar energy for desalination and may solve the restricted water supply for agriculture. (See also W76-09230) (Auen-Wisconsin)
W76-09237

HYDROLOGICAL PROBLEMS ASSOCIATED WITH DEVELOPING GEOTHERMAL ENERGY SYSTEMS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W76-09260

6E. Water Law and Institutions

RESPONSIBILITIES OF OFFSHORE DRILLING REGULATIONS,
Geological Survey, Metairie, La.
For primary bibliographic entry see Field 5G.
W76-08918

PUBLIC OPINION AND THE ENVIRONMENT: ECOLOGY, THE COASTAL ZONE, AND PUBLIC POLICY,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 6G.
W76-09035

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3E.
W76-09065

A GUIDE TO STATE PROGRAMS FOR THE RECLAMATION OF SURFACE MINED AREAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5G.
W76-09142

CRITERIA FOR SELECTING A WATER QUALITY MODEL FOR 208 PLANNING,
Hydrocomp Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5G.
W76-09212

QUALITY ASSURANCE FOR GROUNDWATER,
For primary bibliographic entry see Field 5G.
W76-09213

WATER DIVERSION AND THE MORATORIUM,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 4A.
W76-09234

PROTECTION OF FREE-FLOWING RIVERS,
Oregon State Univ., Corvallis. Dept. of Geography.
R. E. Pfister.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p. 63-72. 1 fig., 8 ref.

Descriptors: *Wild rivers, *Protection, *Wild Rivers Act, *Water policy, Legislation, State governments, Federal government, Conservation, Management, Competing uses, Recreation, Pacific Northwest U.S.

The federal and state legislation designating and protecting free-flowing rivers and the challenges facing the implementation of this policy at the national and state level are discussed. Management and administration are challenged by not only the difficulties associated with the protected area but also with the various activities occurring outside of the designated area. For example, within the designated wild area of the Rogue River in Oregon, the major problem was related to seasonal use and the growth trend in recreation. The rapid increase in recreational use forced the Governor's office to appoint a Rogue River Study Group to review questions about management of the wild river area and the options for controlling use to minimize social and environmental problems. The study group identified 18 problem areas that need investigation. Designation of many wild and scenic rivers has to be weighed on a benefit-cost analysis based on the comparative value for several competing uses, such as hydroelectric power, summer homes and lodges, or other development-oriented options, when classifying a river as wild or scenic. (See also W76-09230) (Auen-Wisconsin).
W76-09235

EPA STANDARDS FOR DRINKING WATER BECOME EFFECTIVE IN JUNE, 1977.
For primary bibliographic entry see Field 5F.
W76-09356

6F. Nonstructural Alternatives

IMPLICATIONS OF ZONING AS AN URBAN WATER MANAGEMENT MEASURE,
Georgia Univ., Athens. Dept. of Real Estate.
C. F. Floyd, and M. J. Rowan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-253 769, $5.50 in paper copy, $2.25 in microfiche. Georgia Environmental Research Center, Atlanta, Report ERC 0576, March 1976. 101 p, 8 fig, 15 tab, 16 ref, 2 append. OWRT B-094-GA(2) 14-31-0001-4153.

Descriptors: *Land use, Regional economics, *Urbanization, *Zoning, Computer models, Georgia, Flood plain zoning, *Land development, Management, *Environmental effects, Model studies, Cities.
Identifiers: Georgia Transportation Planning Land Use model, *Land use zoning.

The objectives were threefold. The first was to improve the data base of the Georgia Transportation Planning Land Use model regarding (1) existing land use and (2) suitability of land for development. This model was developed to assist the Georgia Department of Transportation in analyzing the non-user impacts of transporation facility improvements along rural and semi-rural corridors. The impacts analyzed include employment, population, housing and land use. The second objective was to modify and strengthen the land use submodel to enable it to better analyze the impact of transportation facility improvements on land use change. The third objective was to use the model to analyze the impact of restrictive land use policies on economic development and land use. The project was quite successful in achieving the first two objectives. It was less successful in meeting the third, that of actually using the Georgia Transporation Planning Land Use model to analyze the impacts of restrictive land use zoning. This occurred not because of a fault in the model but because restrictive land use zoning puts little or no constraint on economic development in the type of area analyzed. The available land supply, even if restrictive zoning practices remove some of the land from the developable category is quite large in relationship to projected development far into the future.
W76-08755

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME I, INDIAN BEND WASH REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08806

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME II, CAVE CREEK REPORT,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08807

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME IV, WICKENBURG REPORT.
Army Engineer District, Los Angeles, Calif.

For primary bibliographic entry see Field 4A.
W76-08808

FLOOD PLAIN INFORMATION: MARICOPA COUNTY ARIZONA, VOLUME V, NEW RIVER REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08809

FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08810

SPECIAL FLOOD HAZARD INFORMATION: MILL CREEK-GEKELER SLOUGH, LA GRANDE, OREGON.
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 4A.
W76-08811

FLOOD PLAIN INFORMATION: RUSH CREEK-PETALUMA RIVER TO U. S. HIGHWAY 101, MARIN COUNTY, CALIFORNIA.
Jordon/Mathis and Associates, San Francisco, Calif.; and Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08812

FLOOD PLAIN INFORMATION: KINGS RIVER, SANGER, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08813

FLOOD PLAIN INFORMATION: DRY CREEK AND TRIBUTARIES, ROSEVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08814

FLOOD PLAIN INFORMATION: GUADALUPE RIVER, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08815

FLOOD PLAIN INFORMATION: UMATILLA RIVER TRIBUTARIES, MCKAY, TUTUILLA AND WILDHORSE CREEKS, PENDLETON, OREGON AND VICINITY.
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 4A.
W76-08816

FLOOD PLAIN INFORMATION: COW CREEK, PALO CEDRO, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08817

FLOOD PLAIN INFORMATION: DARDENNE AND BELLEAU CREEKS, ST. CHARLES COUNTY, MISSOURI.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-08818

FLOOD PLAIN INFORMATION: ST. CHARLES COUNTY, MISSOURI, PART 2, PERUQUE CREEK.
Russell and Axon, St. Louis, Mo.; and Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-08819

FLOOD PLAIN INFORMATION: MIDDLE RIVER ROUGE, NORTHVILLE, MICHIGAN.
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W76-08820

FLOOD PLAIN INFORMATION: SAPPA CREEK, OBERLIN, KANSAS.
Army Engineer District, Kansas City, Kans.
For primary bibliographic entry see Field 4A.
W76-08821

FLOOD PLAIN INFORMATION: ARKANSAS RIVER, DERBY-MULVANE, KANSAS.
Army Engineer District, Tulsa, Oklahoma.
For primary bibliographic entry see Field 4A.
W76-08822

A CRITICAL STUDY OF FLOOD PROTECTION PLANNING IN THE SUSQUEHANNA RIVER BASIN: 1936-1972,
Cornell Univ., Ithaca, N. Y.
E. H. Preston, and C. D. Gates.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-253 775, $5.00 in paper copy, $2.25 in microfiche. Cornell University Water Resources and Marine Sciences Center, Technical Report No. 100, April 1976. 65 p, 2 fig, 9 tab, 23 ref. OWRT A-045-NY (4) 14-31-0001-4032

Descriptors: *Flood protection, *Comprehensive planning, *River basins, Pennsylvania, Dams, Flood control, Environment, Communication, History, Projects, Risks, New York, Reservoirs, Flood damage, Planning agencies, Effects, *Priorities, Social needs, Social values, Social change, Social participation, Coordination, Information exchange, Flood plains.
Identifiers: *Public participation, *Susquehanna River Basin, Coordination committee, Local, State, Public opinion.

This study considers the history of flood protection planning in the susquehanna River Basin prior to June 1972, with special emphasis on the leadership role of the U. S. Corps of Engineers. The formation, procedures and outlines of the comprehensive plan developed by the Susquehanna River Basin Coordinating Committee (SRBCC) are described. The efforts of a University research group to establish two-way communication between the public and the planners, specifically to encourage public response to a draft plan through a series of workshops and public forums, are summarized. The expansion of the role of State and local planning agencies in flood protection planning in the New York and Pennsylvania portions of the basin during the decade prior to 1972, culminated in the creation of the Susquehanna River Basin Commission. Public opinion showed a gradual shift in high priority concerns, from structural flood protection measures, to environmental quality, and finally to flood plains management. The long delay in construction of the two large dams (Tioga Hammond and Cowanesque) in Pennsylvania results from a long history of local opposition until Hurricane Agnes in June 1972. Finally, the concept of flood risk and the problems inherent in insuring a general understanding of it by the public are reviewed. The study concludes that flood protection planning in the Susquehanna River Basin during the period 1936-1972 was adversely affected by the reordering of the priorities of both planners and public that occurred during the last third of the period. As protection of environmental resources replaced the development of resources as a top priority, structural protection measures lost their appeal to both planners and public.
W76-08846

6G. Ecologic Impact Of Water Development

IMPLICATIONS OF ZONING AS AN URBAN WATER MANAGEMENT MEASURE,
Georgia Univ., Athens. Dept. of Real Estate.
For primary bibliographic entry see Field 6F.
W76-08755

RATIONALE FOR A WATER POLLUTION CODE PART 1: THE WASTE SYSTEM AND THE NATURAL SYSTEM,
Monash Univ., Clayton (Australia). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W76-08839

A CRITICAL STUDY OF FLOOD PROTECTION PLANNING IN THE SUSQUEHANNA RIVER BASIN: 1936-1972,
Cornell Univ., Ithaca, N. Y.
For primary bibliographic entry see Field 6F.
W76-08846

ENVIRONMENTAL EFFECTS OF COOLING SYSTEMS AT NUCLEAR POWER PLANTS,
International Atomic Energy Agency, Vienna (Austria).
For primary bibliographic entry see Field 5C.
W76-08848

ENVIRONMENTAL ASPECTS OF THE COOLING SYSTEMS OF THERMAL POWER STATIONS: REPORT ON THE SEMINAR HELD AT ZURICH, MAY CONCLUSIONS AND RECOMMENDATIONS, (LES ASPECTS D'ENVIRONMENT DES SYSTEMS DE REFROIDISSEMENT DES CENTRALLES THERMIQUES),
Economic Commission for Europe (UN), Geneva (Switzerland). Div. of Energy.
C. Lopes-Polo.
In: Environmental Effects of Cooling Systems at Nuclear Power Plants, CONF-740820, Proceedings of a symposium held at Oslo, August 26-30, 1974. p 25-34, 11 ref.

Descriptors: *Thermal effects, *Environmental effects, Nuclear powerplants, *Conferences, Heat budget, Air pollution effects.
Identifiers: Cooling systems.

The paper reviews the main question considered at the Seminar on Environmental Aspects of the Cooling systems of Thermal Power Stations and reports on the conclusions reached at that seminar. The questions considered were (1) the overall thermal balance of the atmosphere and residual heat from electricity generation; (2) air-cooling systems and their consequences for the environment; and (3) the comparative economics of different cooling systems. (See also W76-08848) (Chilton-ORNL)
W76-08850

AQUATIC PHYSIOLOGY OF THERMAL AND CHEMICAL DISCHARGES,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5C.
W76-08880

TEMPERATURE SELECTION BY FISH--A FACTOR IN POWER-PLANT IMPACT ASSESSMENTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W76-08882

PREDICTING THE ECOLOGICAL CONSEQUENCES OF THERMAL POLLUTION

FROM OBSERVATIONS ON GEOTHERMAL HABITATS,
Wisconsin Univ. Madison, Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W76-08883

PUBLIC OPINION AND THE ENVIRONMENT: ECOLOGY, THE COASTAL ZONE, AND PUBLIC POLICY,
California Univ., Santa Barbara.
C. C. Hetrick, C. J. Lieberman, and D. R. Ranish.
Available from the National Technical Information Service, Springfield, Va 22161, as COM 75-10840, $3.50 in paper copy. Coastal Zone Management Journal, Vol. 1, No. 3, p 275-289, 1974. 2 tab.

Descriptors: *Environment, Political aspects, *Political constaints, *Surveys, *Coasts, Evaluation, Costs, Governments, Psychological aspects, Ecology, *California.
Identifiers: *Public opinion, Environmental concern, *Coastal zone, *Public policy, Casual factors, Perceived impact, *Santa Barbara(CA).

A sample survey was undertaken to understand citizen opinion on coastal zone usage and planning within a broad context of public attitudes regarding environmental policy and related political issues. Of the 523 persons interviewed, 73% thought environmental concerns were serious problems; 18% thought there were problems but not serious; 6% stated there were no environmental problems. This shows a high degree of concern, but within the context of other problems, environment was ranked third as a problem for Santa Barbara County and fourth for the nation. Population and crime are ranked higher in the county, and for the nation these two factors plus poverty are ranked above the environment. People were generally reluctant to spend additional tax money on environmental problems. Education and age, along with political participation, were major variables associated with concern for the environment. It is believed that causal inference should be limited to education and age. That younger respondents show more environmental concern can be explained in part by recent environmental activism. Also, better educated people generally tend to receive more information which increases the likelihood of awareness of problem. Another variable is the perceived impact of problems which can help to explain the age and education variables in that younger persons tend to have a bigger stake in the future, and better-educated persons tend to perceive more impacts of problems. Incentives, other than economic, will be necessary to mobilize people around intangible environmental problems. (Smith-North Carolina)
W76-09035

DESERT ECOSYSTEMS: HIGHER TROPHIC LEVELS,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 2A.
W76-09064

THE NATURE AND CAUSES OF DESERTIZATION,
International Livestock Centre for Africa, Addis Ababa (Ethiopia).
For primary bibliographic entry see Field 4C.
W76-09069

THE SAHEL: TIME FOR A NEW APPROACH,
For primary bibliographic entry see Field 4C.
W76-09070

A GUIDE TO STATE PROGRAMS FOR THE RECLAMATION OF SURFACE MINED AREAS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5G.
W76-09142

NORTHERN GREAT PLAINS RESOURCE PROGRAM. SURFACE RESOURCE WORK GROUP--REGIONAL PROFILE.
Northern Great Plains Resource Program, Denver, Colo.
For primary bibliographic entry see Field 4C.
W76-09228

OCEAN DUMPING--A RATIONAL APPROACH TO AN INTERNATIONAL PROBLEM,
Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-09304

MINERAL RESOURCE MANAGEMENT OF THE OUTER CONTINENTAL SHELF.
Geological Survey, Reston, Va.
M. V. Adams, C. B. John, R. F. Kelly, A. E. La Pointe, and R. W. Meurer.
Circular No. 720, 1975. 36 p, 11 fig, 15 tab, 20 ref.

Descriptors: *Continental Shelf, *Environmental effects, *Resources development,Oil, Gases, Water resources, Management, Leases, Exploration, Exploitation, Resource allocation, Fossil fuels, Natural gas, OPtimum development plants, Safety, Water pollution sources.
Identifiers: *Outer Continental Shelf, Oil and gas, Mineral resources, Environmental impact.

Management of the mineral resource of the Outer Continental Shelf has been a function of the Geological Survey. This circular explains the procedures which are involved in leasing procedures, evaluation of resources, and supervision of production operations on leased lands of the Outer Continental Shelf. Baseline studies are conducted in frontier areas to establish an environmental benchmark against which future measurements can be compared to detect possible adverse effects resulting from exploration and development activities. Resource conservation and efforts to increase operational margins of safety are explained. The particular resources dealt with in this circular are oil and gas. Statistical data are included. (Sinha - OEIS)
W76-09306

ECOLOGICAL EFFECTS OF OFFSHORE CONSTRUCTION,
Marine Science Inst., Bayou La Batre, Ala.
G. A. Rounsefell.
Journal of Marine Science, Vol 2, No 1, 1972. 213 p, 254 ref. DACW72-71-C-0002.

Descriptors: *Continental Shelf, *Resources development, *Environmental effects, Water resources, *Water pollution effects, Offshore platforms, Engineering structures, Deep water habitats, Buoys, Barriers, Excavation, Exploration, Exploitation, Storage, Bibliographies.
Identifiers: *Outer Continental Shelf, Offshore technology, Environmental impact, Site selection, Artificial islands, Tidal dams, Ecological effects, Floating airports, Floating cities, Artificial reefs.

A literature survey is presented to set forth current knowledge of environmental effects of offshore construction with reference to artificial islands, buoys, floating bridges, underwater habitations, floating airports, floating cities, underwater pipelines, tunnels, artificial reefs, hurricane barriers, tidal dams, subsea storage of oil and other commodities, offshore platforms, and deep harbor excavation by blasting. An annotated bibliography is included as an appendix. It is pointed out that it is impossible to carry on any type of construction without disturbance. In particular, where islands are constructed, the extent and permanence of damage depends on many factors. Careful site selection may lessen damages and in some instances may bring benefits that will offset or even outweigh any damages. Strong factors in site selection are depth of water, range of tides, predicted storm surges, and probable wave action. The author suggests that the greatest dangers lie in the placement of artificial islands too closely adjacent to estuaries where they can significantly effect water eschange, and in the proliferation of water cooled nuclear power plants. (Sinha - OEIS)
W76-09307

REPORT ON THE HYDROLOGIC AND SEDIMENTOLOGIC STUDY OF THE OFFSHORE SPOIL DISPOSAL AREA, SAVANNAH, GEORGIA,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5E.
W76-09309

REPORT OF THE CONFERENCE ON MARINE RESOURCES OF THE COASTAL PLAINS STATES, DECEMBER 11-12, 1975, SAVANNAH, GEORGIA.
Coastal Plains Center for Marine Development Services, Wilmington, N.C.
For primary bibliographic entry see Field 5G.
W76-09329

OFFSHORE MULTI-USE PORT ISLANDS AND THEIR ENVIRONMENT,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5G.
W76-09376

THE OFFSHORE ECOLOGY INVESTIGATION,
Gulf Universities Research Consortium, Gulfport, Miss.
For primary bibliographic entry see Field 5G.
W76-09382

7. RESOURCES DATA

7A. Network Design

ON THE COMPONENTS OF TIME SERIES; THE REMOVAL OF SPATIAL DEPENDENCE,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Applied Mathematics.
For primary bibliographic entry see Field 2B.
W76-08803

DESIGN OF NATIONWIDE WATER-QUALITY-MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-09209

ANALYTICAL CHEMISTRY IN WATER POLLUTION CONTROL,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5A.
W76-09221

7B. Data Acquisition

IMPROVED PROCEDURE FOR ION EXCHANGE EXPERIMENTS WITH SOILS USING LEACHING TUBES, AND HANDLING OF WATER REPELLENT SOILS, (IN GERMAN),
For primary bibliographic entry see Field 2G.
W76-08762

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES-I. LITERATURE REVIEW,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-08767

INTERCONTINENTAL COMPARISON OF EVAPORATION ESTIMATES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-08800

WATER RETENTION BY CORE AND SIEVED SOIL SAMPLES,
Agricultural Research Service, Bushland, Tex.
For primary bibliographic entry see Field 2G.
W76-08802

APPARATUS AND METHOD FOR MAKING SNOW WITH UNIFORM DROP SIZE,
Hedco, Inc., Paramus, N.J. (Assignee).
G. C. Dewey.
U.S. Patent No. 3,948,442, 4 p, 4 fig, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 945, No 1, p 222, April 6, 1976.

Descriptors: *Patent, *Snow, Snow cover, Crystals, Skiing, Snow management, Application equipment.
Identifiers: Snow-making equipment.

An airless snow-making machine is provided in which ice nuclei and water drops are formed separately, commingled, and discharged to form snow-like crystals. The water drops are uniform and are formed by cyclically disturbing linear water streams discharged from an orifice plate of a nozzle assembly. The cyclic disturbance effects the breaking off of water drops of uniform size from the fluid streams. (Sinha - OEIS)
W76-09051

CONDITIONS FOR USING A TENSIONPLATE AS A LYSIMETER, (IN GERMAN),
Agricultural Univ., Wageningen (Netherlands). Lab. of Agricultural Chemistry.
For primary bibliographic entry see Field 2G.
W76-09082

EXPEDIENT TECHNIQUE OF PERMANENT OBSERVATIONS -- AN INDISPENSABLE TOOL ON STUDYING THE LIMNOLOGY OF RIVERS,
W. Schmitz.
Verhandlungen, Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Vol. 19, p 2020-2027, 1975. 11 fig., 10 ref.

Descriptors: Methodology, *Sampling, *Laboratory tests, *Data collections, *On-site data collections, *Monitoring, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand, Oxygen sag, Chlorides, Rivers, Limnology, *Pollutant identification.
Identifiers: *Neckar River(Germany).

An economical and effective method of collecting comparable chemical and physical data in rivers is described. Data are presented on chemical and physical conditions in the River Neckar and the sampling apparatus is depicted. (Katz)
W76-09106

REPRESENTATIVE ANALYTICAL WASTE WATER SAMPLES. NOTE I--A NEW SAMPLER (SIGNIFICATIVA DI CAMPIONI ANALITICI DI ACQUE REFLUE. NOTA I -- NUOVO DISPOSITIVO DI CAMPIONAMENTO),
For primary bibliographic entry see Field 5A.
W76-09186

A NEW STRATIFIED PLANKTON SAMPLER FOR SHALLOW WATERS, (IN SPANISH),
La Plata Univ. (Argentina). Instituto del Museo.
R. A. Ringuelet, and L. A. Bulla.
Physis Aguas Cont Org Secc B. 33(87), p 241-246, 1974.

Descriptors: *Sampling, Plankton, Shallow water, Stratification, *Chemical stratification, Pollutant identification.
Identifiers: *Plankton samplers, *Biological stratification(Plankton).

A new sampler to be used mostly in studies on biological and chemical stratification in shallow waters is described. Basically it is a pump with a newly designed suction head. It provides a sample from a very thin stratum (12 cm thick). The depth and volume can be adjusted very precisely, and it can take very large samples in a short time.--Copyright 1975, Biological Abstracts, Inc.
W76-09193

AN EVALUATION OF ERTS DATA FOR OCEANOGRAPHIC USES THROUGH GREAT LAKE STUDIES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2H.
W76-09244

A LIGHT WEIGHT CORER FOR SAMPLING SOFT SUBAQUEOUS DEPOSITS,
University Coll., Dublin (Ireland). Dept. of Zoology.
For primary bibliographic entry see Field 2J.
W76-09266

AN AUTOMATIC RELEASE INSTRUMENT WITH UNDERWATER BUOY FOR MARKING OF FIELD EQUIPMENT,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
L. Hakanson, L. Edlund, and R. Uhrberg.
Water Resources Research, Vol. 12, No. 2, p 309-312, April 1976. 6 fig, 1 ref.

Descriptors: *Instrumentation, Equipment, *Timing, *Buoys, Underwater, Sedimentation rates, Sampling, Electrical equipment, Research equipment, Limnology, Lakes, Sediments, Bottom sediments.
Identifiers: *Buoy release instrumentation, Timing devices, Automatic release instrument.

In practical fieldwork one often encounters the problem of marking registration instruments placed below the water surface. Marking buoys can for various reasons disappear if they are placed visibly, valuable equipment and data thus being lost. In this paper a new technique and a new instrument for marking field equipment were introduced. The instrument, which in principle consists of an anchor, a buoy, an electronic circuit with a clock, and a release mechanism, is to be placed on the bottom. After a predetermined time span the clock triggers the release mechanism, and the buoy and the instrument float to the surface, where they can be collected with good accuracy in time. (Sims - ISWS)
W76-09268

DEVELOPMENT OF A WATER QUALITY INSTRUMENTATION PACKAGE FOR LONG-TERM OPERATION FROM BUOYS AND OTHER UNATTENDED MARINE PLATFORMS,
National Marine Fisheries Service, Washington, D.C. Data Buoy Office.
For primary bibliographic entry see Field 5G.
W76-09372

A NEW DEVICE FOR SUBSAMPLING PLANKTON SAMPLES,
South Carolina Marine Resource Research Inst., Charleston.
V. G. Burrell Jr, W. A. Van Engel, and S. G. Hummel.
J Cons Cons Int Explor Mer. 35(3), p 364-366, 1974.

Descriptors: *Plankton, *Sampling, Instrumentation, Distribution, Pollutant identification.

With the device described, an even distribution of plankters may be obtained prior to splitting, and plankton that adhere to the apparatus may be washed unbiased into the two aliquots. Another feature of the device allows concentration of the sample during splitting. A complete description of the construction and use of the splitter is given. -- Copyright 1975, Biological Abstracts, Inc.
W76-09396

A METHOD FOR THE RAPID SORTING OF PLANKTON INTO A NUMBER OF SIZE GROUPS,
Oslo Univ. (Norway). Inst. of Marine Biology; and Olso Univ. (Norway). Dept. of Limnology.
L. A. Kirkerud.
J Cons Cons Int Explor Mer. 35(3), p 367-369, 1974.

Descriptors: Plankton, *Sampling, Methodology, *Zooplankton, *Sieves, Instrumentation, Pollutant identification.

There is a demand for a rapid and reliable method to separate zooplankton into different species and size groups and to meet this need, a system of sieves names the 'sieve carousel' was constructed. The sieve carousel is, in principle, a circular trough with the sieves mounted around the edge and rotating about an inclined axis. A complete description is provided.--Copyright 1975, Biological Abstracts, Inc.
W76-09397

7C. Evaluation, Processing and Publication

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME I, INDIAN BEND WASH REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08806

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME II, CAVE CREEK REPORT,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08807

FLOOD PLAIN INFORMATION: MARICOPA COUNTY, ARIZONA, VOLUME IV, WICKENBURG REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08808

FLOOD PLAIN INFORMATION: MARICOPA COUNTY ARIZONA, VOLUME V, NEW RIVER REPORT.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W76-08809

FLOOD PLAIN INFORMATION: NORTHEAST STREAM GROUP, STOCKTON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08810

SPECIAL FLOOD HAZARD INFORMATION: MILL CREEK-GEKELER SLOUGH, LA GRANDE, OREGON.
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 4A.
W76-08811

FLOOD PLAIN INFORMATION: RUSH CREEK-PETALUMA RIVER TO U. S. HIGHWAY 101, MARIN COUNTY, CALIFORNIA.
Jordon/Mathis and Associates, San Francisco, Calif.; and Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08812

FLOOD PLAIN INFORMATION: KINGS RIVER, SANGER, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08813

FLOOD PLAIN INFORMATION: DRY CREEK AND TRIBUTARIES, ROSEVILLE, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08814

FLOOD PLAIN INFORMATION: GUADALUPE RIVER, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W76-08815

FLOOD PLAIN INFORMATION: UMATILLA RIVER TRIBUTARIES, MCKAY, TUTUILLA AND WILDHORSE CREEKS, PENDLETON, OREGON AND VICINITY.
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 4A.
W76-08816

FLOOD PLAIN INFORMATION: COW CREEK, PALO CEDRO, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W76-08817

FLOOD PLAIN INFORMATION: DARDENNE AND BELLEAU CREEKS, ST. CHARLES COUNTY, MISSOURI.
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-08818

FLOOD PLAIN INFORMATION: ST. C... COUNTY, MISSOURI, PART 2, PERUQ... CREEK.
Russell and Axon, St. Louis, Mo.; and Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 4A.
W76-08819

FLOOD PLAIN INFORMATION: MIDDLE RIVER ROUGE, NORTHVILLE, MICHIGAN.
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W76-08820

FLOOD PLAIN INFORMATION: SAPPA CREEK, OBERLIN, KANSAS.
Army Engineer District, Kansas City, Kans.
For primary bibliographic entry see Field 4A.
W76-08821

FLOOD PLAIN INFORMATION: ARKANSAS RIVER, DERBY-MULVANE, KANSAS.
Army Engineer District, Tulsa, Oklahoma.
For primary bibliographic entry see Field 4A.
W76-08822

URBAN RUNOFF MODELLING,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Div.
For primary bibliographic entry see Field 4A.
W76-09033

INDUSTRIAL DEVELOPMENT THROUGH WATER-RESOURCES PLANNING,
Department of Commerce, Washington, D. C.
For primary bibliographic entry see Field 3E.
W76-09034

MOUNTAINOUS WINTER PRECIPITATION: A STOCHASTIC EVENT-BASED APPROACH,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; and Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2B.
W76-09062

COMPARATIVE EVALUATION OF YEARLY CLIMATIC FACTORS WITH THE FIVE YEARS AVERAGES FOR FUDHALIYA AGRO-METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09066

COMPARATIVE EVALUATION OF CLIMATIC FACTORS AND CONDITIONS AT FUDHALIYA AGRO-METEOROLOGICAL STATION AND BAGHDAD AIRPORT METEOROLOGICAL STATION,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W76-09067

HYDROLOGIC UNIT MAP--1974, STATE OF MINNESOTA.
Geological Survey, Reston, Va.
Hydrologic Unit Map, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Minnesota, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(Minn), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Minnesota that are basically hydro-...ic in nature. The Cataloging Units shown will ... Cataloging Units previously used by ... Survey in its Catalog of Information on ... (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-09131

GROUND-WATER LEVELS AND CHEMICAL QUALITY OF GROUND WATER IN LINCOLN, MONTANA,
Geological Survey, Helena, Mont.
K. R. Wilke.
Open-file map 76-333, April 1976. 4 sheets.

Descriptors: *Water pollution sources, *Septic tanks, *Groundwater movement, *Water levels, *Montana, Data collections, *Maps, Water wells, Water supply.
Identifiers: *Lincoln(Mont).

Maps and tables describe chemical quality and water levels of groundwater in Lincoln, Montana. Residents of this unincorporated town have individual wells and septic tanks. Groundwater level below land surface ranged from 2 to 10 feet (0.6 to 3 metres) in September 1974 and June 1975. Groundwater samples had low concentrationsof nitrite plus nitrate, total ammonia, and phosphate. Nitrite plus nitrate (as nitrogen) ranged from 0.01 to 0.53 mg/litre and averaged 0.13 mg/litre for 37 samples in October 1974, and ranged from 0.05 to 0.75 mg/litre and averaged 0.22 mg/litre for 30 samples in May 1975. Groundwater in the Lincoln area does not appear to be significantly degraded by septic-tank effluent. (Woodard-USGS)
W76-09132

STATISTICS OF DATA TRANSFER,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W76-09133

SUMMARY OF HYDROLOGIC DATA COLLECTED DURING 1974 IN DADE COUNTY FLORIDA,
Geological Survey, Tallahassee, Fla.
J. E. Hull.
Open-file report FL-75012, 1975. 128 p, 43 fig, 8 tab, 8 ref.

Descriptors: *Basic data collections, *Groundwater, *Surface waters, *Hydrologic data, Streamflow, Water yield, Water levels, Aquifers, Withdrawal, Saline water intrusion, Rainfall, Bays, *Florida.
Identifiers: Dade County(Fla), Biscayne Bay(Fla).

This report is ninth in a series documenting the annual hydrologic conditions in Dade County, Florida. The hydrologic conditions in Dade County for the 1974 water year (October 1, 1973 to September 30, 1974) are summarized in tables, graphs, and maps. During the 1974 calendar year rainfall was 18.53 inches below the long-term average. Groundwater levels ranged from 0.1 foot above to 0.4 foot below average. In the 1974 water year, the combined average daily discharge from eight major streams and canals that flow into Biscayne Bay was 890 cfs, 230 cfs below the combined average daily flow for the 1973 water year. The combined average daily flow through the Tamiami Canal outlets was 760 cfs, 58 cfs below that of the 1973 water year. The 1974 position of the salt front in the coastal part of the Biscayne aquifer was about the same as in 1973 except at Miami International Airport and Homestead Air Force Base where the salt front had encroached farther inland. (Woodard-USGS)
W76-09135

GROUND-WATER DATA FOR SUNFLOWER COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
B. E. Wasson.
Mississipi Board of Water Commissioners, Jackson, County Report No 2, 1975. 30 p, 3 fig, 3 tab, 9 ref.

Descriptors: *Groundwater resources, *Water quality, *Basic data collections, *Well data, *Chemical analysis, Aquifers, Water wells, Hydrologic data, Drillers logs, Sites, Maps, *Mississippi.
Identifiers: Sunflower County(Miss).

This is one in a series of groundwater basic-data reports being prepared for the 82 counties concerning information about the availability and quality of water in Mississipi. Data compilation and report preparation were by the U.S. Geological Survey in financial cooperation with the Mississipi Board of Water Commissioners. The data for this report (Sunflower County) are presented in three tables: (1) records for nearly 700 wells, (2) chemical analyses, and (3) sand intervals from

electric logs. Three maps show the locations of the wells for which data are presented in the tables. (Woodard-USGS)
W76-09140

GROUND-WATER DATA FOR CARROLL COUNTY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
J. A. Callahan.
Mississippi Board of Water Commissioners, Jackson, County Report No 3, 1975. 26 p, 3 fig, 3 tab, 8 ref.

Descriptors: *Groundwater resources, *Water quality, *Basic data collections, *Well data, *Chemical analysis, Aquifers, Water wells, Sites, Maps, Hydrologic data, Drillers logs, *Mississippi.
Identifiers: Carroll County(Miss).

This is one in a series of groundwater basic-data reports being prepared for the 82 counties concerning information about the availability and quality of water in Mississippi. Data compilation and report preparation were by the U.S. Geological Survey in financial cooperation with the Mississippi Board of Water Commissioners. The data for this report (Carroll County) are presented in three tables: (1) well records, (2) chemical analyses, and (3) sand intervals from electric logs. Three maps show the locations of the wells for which data are presented in the tables. (Woodard-USGS)
W76-09141

RECORDS OF WELLS, DRILLERS' LOGS, WATER-LEVEL MEASUREMENTS, AND CHEMICAL ANALYSES OF GROUND WATER IN CHAMBERS, LIBERTY, AND MONTGOMERY COUNTIES, TEXAS, 1966-74,
Geological Survey, Austin, Tex.
W. L. Naftel, B. Fleming, and K. Vaught.
Texas Water Development Board, Austin, Report 202, March 1976. 62 p, 3 fig, 12 tab, 3 ref.

Descriptors: *Hydrologic data, *Groundwater resources, *Water levels, *Chemical analysis, *Drillers logs, Texas, Well data, Aquifer characteristics, Water quality, Water chemistry, Basic data collections.
Identifiers: *Chambers County(Tex), *Liberty County(Tex), *Montgomery County(Tex).

Reports describing the groundwater resources of Chambers, Liberty, and Montgomery Counties were prepared and published in 1971, 1968, and 1971, respectively. Wesselman and Aronow (1971), in describing the resources of Chambers County, tabulated records of wells, drillers' logs, water-level measurements, and chemical analyses gathered during the course of their study. This report presents data (1966-74) collected since the investigation by Wesselman and Aronow (1971) and updates records tabulated by Anders and others (1968) in Liberty County, and by Popkin (1971) in Montgomery County. These records are being collected in cooperation with the Texas Water Development Board to evaluate the groundwater resources of the greater Houston-Galveston region. (Woodard-USGS)
W76-09144

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS,
Geological Survey, Little Rock, Ark.
R. K. Knott.
Open-file report, May 1976. 16 p, 2 tab.

Descriptors: *Streamflow, *Flow rates, *Gaging stations, *Arkansas, Water quality, Networks, Sites, Programs.

This is a brief summary of the objectives, accomplishments, and work plans of the cooperative program between the Arkansas Department of Pollution Control and Ecology and the U.S. Geological Survey. Also presented are stream discharge data collected at about 80 sites for the water year 1975. Several discharges for miscellaneous dates in the 1974 water year are included. The station numbers and names were devised and assigned by the Arkansas Department of Pollution Control and Ecology. (Woodard-USGS)
W76-09145

RESULTS OF PHYTOPLANKTON SAMPLING AT NATIONAL STREAM QUALITY ACCOUNTING NETWORK STATIONS IN MONTANA--1975 WATER YEAR,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 5A.
W76-09146

LOW-FLOW CHARACTERISTICS AND MEAN ANNUAL DISCHARGE OF NORTH BRANCH MANITOWOC RIVER AT POTTER, WISCONSIN,
Geological Survey, Madison, Wis.
B. K. Holmstrom.
Open-file report 76-204, April 1976. 11 p, 2 fig, 1 plate, 4 tab, 2 ref.

Descriptors: *Streamflow, *Low flow, *Average flow, *Pre-impoundment, *Data collections, Hydrologic data, *Wisconsin.
Identifiers: *Potter(Wisc), *North Branch Manitowoc River(Wisc).

The low-flow characteristics presented are the annual minimum 7-day mean flows at the 2-year recurrence interval and 10-year recurrence interval. The flows were determined just downstream from the confluence of the three streams forming the North Branch Manitowoc River, at Potter, Wisc., and, based on natural-flow conditions, are 0.0 cfs (0.0 cu m/sec). Observations made in October 1974 showed that low natural discharge of the three streams forming the North Branch Manitowoc River was 0.0 cfs (0.0 cu m/sec). A discharge of 0.30 cfs (0.008 cu m/sec) was measured in the tributary from Hilbert but this was predominantly effluent from the sewage-treatment plant and a cheese factory in Hilbert. The mean annual discharge at Potter is 27 cfs (0.76 cu m/sec). This was based on the estimated and recorded discharge for June 1, 1974, to May 31, 1975, for the North Branch Manitowoc River at Potter site and an adjustment based on the long-term mean annual discharge at gaging station Sheboygan River at Sheboygan. These estimates will help the Wisconsin Department of Natural Resources evaluate a proposed impoundment for wildlife on the North Branch Manitowoc River at Potter. (Woodard-USGS)
W76-09147

DESIGN OF NATIONWIDE WATER-QUALITY-MONITORING NETWORKS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5A.
W76-09209

ANALYTICAL CHEMISTRY IN WATER POLLUTION CONTROL,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5A.
W76-09221

WATER MONITORING - JIM BRIDGER PROJECT - SWEETWATER COUNTY, WYOMING,
Fox (F. M.) and Associates, Inc., Wheat Ridge, Colo.
For primary bibliographic entry see Field 5A.
W76-09349

FUNDAMENTAL GEOLOGIC PRINCIPLES,
T. E. Gass.
Water Well Journal, Vol. 30, No. 4, p. 28-29, April 1976, 3 fig.

Descriptors: *Geologic formations, *Sedimentary structures, Sedimentary rocks, Erosion, Wells, *Logging(Recording).
Identifiers: Law of Uniformitarianism, Law of Superposition, Law of Original Horizontality, Law of Truncation by Erosion or Dislocation, Law of Faunal Succession, Geologic processes, Well log interpretation.

The Laws of Uniformitarianism and Superposition are basic to all contemporary geologic theory. Uniformitarianism, as originally proposed by James Hutton, states that the physical laws which operate in the present, probably have operated throughout the geologic past. The Law of Superposition says that in any pile of sedimentary strata, that has not been disturbed, the strata on top will be the youngest and the lower most strata will be the oldest. Similarly, the Laws of Original Horizontality, Truncation by Erosion or Dislocation, and Faunal Succession describe ongoing geologic processes. A working knowledge of these laws and processes will aid in interpretation of well logs. (Heiss-NWWA)
W76-09362

8. ENGINEERING WORKS

8A. Structures

DIFFUSER DESIGN,
Simons (H. A.) International Ltd., Vancouver (British Columbia).
F. J. Shumas.
In: Canadian Pulp and Paper Association Environment Improvement Conference, Vancouver, October 15-17, 1975 Preprinted Proceedings I(Montreal, P.Q.), p 17-24. 10 fig, 14 ref.

Descriptors: *Outlets, *Design, *Hydraulic engineering, Theoretical analysis, Equations, Hydraulic structures, Pulp wastes, Equipment, Discharge(Water), Effluents, Waste water disposal, Waste disposal.
Identifiers: *Diffusers.

This article summarizes some of the more practical theory and equations used in the design of diffuser systems to meet the hydraulic and effluent disposal parameters required with regard to waste water discharge into different receiving environments. Reference is made to actual pulp mill disposal systems in oceans, estuaries, lakes, and rivers, as well as to some of the unusual circumstances that had to be overcome to optimize a system design. Example calculations are also given in the appendices on the analysis used in the systems design. (Witt-IPC)
W76-09291

ECOLOGICAL EFFECTS OF OFFSHORE CONSTRUCTION,
Marine Science Inst., Bayou La Batre, Ala.
For primary bibliographic entry see Field 6G.
W76-09307

FEATURES OF VARIOUS OFFSHORE STRUCTURES,
Raymond Technical Facilities, Inc., New York.
J. Peraino, B. L. Chase, T. Plodowski, and L. Amy.
Available from the National Technical Information Service, Springfield, Va. 22161, as NTIS AD-A012 843, $5.50 in paper copy, $2.25 in microfiche. United States Army Coastal Engineering Research Center Miscellaneous Paper No. 3-75, April -1975. 113 p, 62 fig, 3 tab, refs.

Descriptors: *Continental shelf, *Environmental effects, Water resource development, Structures,

*Coastal structures, *Offshore platforms, *Breakwaters, Lighthouses, Waves(Water), Ocean waves, Currents(Water), Winds, Construction, Construction materials, Construction costs, Foundations, Scour, Biota, Aesthetics, Northeast U. S., California, Louisiana, Alaska, North Carolina.
Identifiers: *Outer Continental Shelf, Offshore technology, Environmental impact, *Offshore structures, Artificial islands, Underwater foundations, Chesapeake Bay Bridge Tunnel, Diamond Shoale Light Station, Cape Hatteras(NC), Cook Inlet(AK).

Various offshore structures described as any permanent fixed structure in an ocean or estuarine location essentially unconnected to shore are classified and evaluated from the technical, environmental and economic aspects. Gravity structures include the Chesapeake Bay Bridge Tunnel, various permanent drilling islands off the California coast and offshore breakwaters off northeastern United States and California. Pile supported structures include Diamond Shoale Light Station, Cape Hatteras, NC: offshore production and gathering facilities off Louisiana; and two types of drilling-production platforms - 'Monopod' platform, Cook Inlet, Alaska, and Platform B off Louisiana. Type of construction, location, physical environment, design data, structural performance, biota, aethetics, engineering, construction, contractors, construction date and construction costs are given for each structure and numerous references are listed for each structure. (Sinha-OEIS)
W76-09311

THE ROLE OF ENGINEERING IN MINIMIZING OFFSHORE IMPACTS,
Duke Univ., Durham, N. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W76-09331

SIXTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 6-8, 1974, HOUSTON, TEXAS. PREPRINTS, VOLUME II,
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09333

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME II.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09371

8B. Hydraulics

TECHNIQUES OF DEEP WELL DRILLING,
Exxon Co., Houston, Tex. Operations Dept.
S. E. Loy, III.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 11-22, 8 fig, 2 tab.

Descriptors: *Deep wells, *Oil wells, *Drilling equipment, *Drilling fluids.
Identifiers: *Drilling pipe, *Casing strings, Blowout prevention, Abnormal pressure.

The pressing need for new petroleum reserves makes it necessary to drill deeper horizons. Rigs used on a deep well must be large enough to handle drill pipe strings as much as 5 miles long. It also must have enough horsepower to hold and move the weight of the drill string, and run mud pumps. The average rig horsepower rating is about 1,000. Larger rigs have horsepower ratings as high as 4,000. The drilling pipe must be strong enough to withstand downhole pressures exceeding internal pressures of 15,000 psi. Casing strings also must withstand high downhole pressure. Drilling fluids must be modified for deep drilling pressures, as well as temperature. Standard drilling fluids tend to degenerate both physically and chemically under deep hole conditions. Both water based and oil based fluids can be used with the addition of special pressure contact and weighting materials. The abnormal pressure zone is another deep drilling problem requiring special casing methods and drilling fluids. The deep, abnormal pressure well can be drilled successfully, but the planning and technology used must be more detailed than the average depth well. (See also W76-08889) (Heiss-NWWA)
W76-08890

TECHNIQUES OF SHALLOW WELL DRILLING,
Layne Atlantic Co., Norfolk, Va. Water Resources Div.
R. R. Peters.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well Drilling Operations, May, 1975. p 27-38, 1 fig.

Descriptors: *Water wells, Technology, Construction, Resource development.
Identifiers: *Drilling methods, Ground water reserve protection.

Water well drilling began approximately 600 B. C. with the cable tool machine. Since then, rotary, reverse circulation, and air drilling techniques have been developed. These techniques have done much to increase well drilling efficiency. More sophisticated drilling fluids aid todays water well contractor in drilling difficult formations in less time than ever before. Using modern techniques and materials, and combined with present day hydrogeologic knowledge, it is possible to plan, drill and develop water wells of excellent quality. The individual well driller bears the burden of protecting ground water reserves by careful construction methods. It is also the drilling contractors job to promote the water well industry by using the available technology to complete the best water wells possible. (See also W76-08889) (Heiss-NWWA)
W76-08891

DIMENSIONING OF UNDERGROUND SEWER PIPELINES MADE OF PLASTIC TUBES (RASCHET PODZEMNYKH KANALIZATSIONNYKH TRUBOPROVODOV IZ POLIMERNYKH TRUB),
A. V. Sladkov, and A. A. Otstavnov.
Plasticheskie Massy, No. 10, p 65-67, 1975. 2 fig, 3 ref.

Descriptors: *Sewerage, *Sewers, *Pipelines, Pipes, Plastic pipes.
Identifiers: *Pipe sizes, *Nomograms.

Nomograms for the dimensioning of plastic tubes for underground sewer systems and for the determination of wall thicknesses and maximum depth are presented. These are applicable to sewer pipes made of high-density and low-density polyethylene, non-plasticized PVC, and polypropylene for diameters of 160-630 mm. Compared with sewer pipes made of asbestos cement and other conventional ceramic materials, plastic pipes require reduced slope (by 35-50%), and have higher throughput capacity (by about 30%) at the same free cross-section. This results in a reduction of the required earthworks. (Takacs-FIRL)
W76-08962

GIANT MOLE TO DIG SANITARY DISTRICT TUNNELS,
For primary bibliographic entry see Field 5D.
W76-08963

WATER CONTROL SOLVES TOUGH SEWER PROBLEM,
Highway and Heavy Construction, Vol. 119, No. 2, p 34-35, 38, Februar, 1976. 2 fig.

Descriptors: *Sewers, *Flood control, *Construction, *Outfall sewers, Texas, Drainage systems, Tunnels, Storm runoff, Installation.

A complex sewer project in Houston, Texas, involved three methods of controlling flood water drainage and wet subsurface sands. The job consisted of tunnels 78 ft, 168 ft, and 145 ft long in the state right-of-way as part of Houston's Almeda Road Sewer Outfall Project. In the construction of the 145 ft tunnel, the existence of a 10 by 6 ft concrete box culvert nine feet above the proposed tunnel required the control of surface runoff. Flow had to be diverted over and around the work shaft to prevent flooding, and a dirt cofferdam was constructed to permit surface runoff to bypass the tunnel area. In addition, the concrete box culvert was intersected by a 24 inch storm sewer on the east and a 30 inch storm sewer on the west. Steel pipe had to be placed through the culvert to the cofferdam and the two storm sewers were connected during the tunnel construction. Other problems involved the wet subsurface soil conditions, which were alleviated with the installation of an educator system of 21 wellpoints at each end of the tunnel. With extensive planning for both the runoff control and the dewatering system, the Almeda Road Storm under which the system was installed. (Kramer-FIRL)
W76-08967

STEPPED BAFFLED TRASH RACK FOR DROP INLETS,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
W. R. Gwinn.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 1, p 97-107, January-February 1976. 4 fig, 6 tab, 1 ref.

Descriptors: *Spillways, *Drops(Structures), *Intakes, *Trash racks, Hydraulics, Erosion, Sediments, Model studies, Hydraulic models, Weirs, Flow, Discharge(Water), Reservoirs, Structures, Hydraulic structures, Hydraulic engineering.
Identifiers: *Drop inlets.

Various forms of the baffle rack were tested to study their hydraulic performance. Hydraulic coefficients for a drop inlet entrance were determined with various racks installed. Clear water and trash-laden flows were run. Tests were made without a sediment fill in the reservoir and with the sediment filled to crest of the spillway. The scour holes which developed in the sediment fill beneath the rack were measured to determine the average flow velocity under the rack. Studies were also made of the stability of preshaped scour holes both with and without riprap linings. Models of baffled, covered-top drop inlets with entrance racks of various forms performed satisfactorily when subjected to trash-laden flows. The larger racks were more efficient hydraulically than smaller racks since they had smaller entrance-loss coefficients both for clear water and trash-laden flows. Rigid trash had little or no effect on the capacity of covered top drop inlets equipped with a baffle trash rack. Flexible trash reduced the discharge significantly in the weir-flow range, but not in the pipe-flow range. (Sims-ISWS)
W76-09250

A THEORY OF FLOW RESISTANCE FOR VEGETATED CHANNELS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4A.
W76-09252

PRESSURE FLUCTUATIONS IN SUBMERGED JUMP,
Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
S. Narasimhan, and V. P. Bhargava.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 102, No. HY3, Proceedings Paper 12004, p 339-350, March 1976. 7 fig, 8 ref, 2 append.

Descriptors: *Hydraulic jump, *Submergence, *Sluice gates, Hydraulics, Model studies, Energy dissipation, Erosion, Froude number, Velocity, Pressure, Jets.
Identifiers: *Submerged jump, *Surface rolling, Pressure fluctuation.

Mean velocities and pressures in the submerged jump downstream of a sluice gate have been investigated. The empirical relationship between the rate of expansion of the jet and the rate of decay of the maximum velocity have been obtained. The results were compared with those of classical wall jet profiles. The magnitudes and variation pattern of pressure fluctuations along the channel bottom in a free hydraulic jump have been found to agree with those of earlier investigators. The main emphasis was on the measurement of pressure fluctuations in a submerged hydraulic jump and its relationship with the efflux Froude number and submergence. It has been shown that the pressure fluctuations along channel bottom in a submerged hydraulic jump are lower than that in a free jump - a significant characteristic which may be considered in designing a mobile bed channel, since it governs the inception and rate of erosion of the channel bed. Although a free jump is preferred over a submerged jump from energy dissipation considerations, the erosive power of a free jump may sometimes be more than that of a submerged jump due to the large intensities of pressure fluctuations encountered on the beds in the former. (Singh-ISWS)
W76-09265

SEVENTH ANNUAL OFFSHORE TECHNOLOGY CONFERENCE, MAY 5-8, 1975, HOUSTON, TEXAS. PREPRINTS, VOLUME III.
Offshore Technology Conference, Dallas, Tex.
For primary bibliographic entry see Field 5G.
W76-09374

EVALUATION OF OFFSHORE BREAKWATER STABILITY UNDER WAVE ACTION,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09387

EFFECT OF OFFSHORE STRUCTURES ON SHORELINE EVOLUTION, ATLANTIC GENERATING STATION,
Army Engineers Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 5G.
W76-09388

8C. Hydraulic Machinery

POWER FACTORS AND ELECTRICAL DEMANDS OF CENTER-PIVOT IRRIGATION MACHINES,
Agricultural Research Service, Lincoln, Nebr. North Central Region.
For primary bibliographic entry see Field 3F.
W76-08770

BELLEVILLE PLANT USES 15 PUMPS IN FOUR STATIONS,
Water and Pollution Control, Vol. 114, No. 3, p 26-27, March, 1976.

Descriptors: *Pumping plants, *Pumps, *Pumping, *Sewers, Treatment facilities, Centrifugal pumps, Hydraulic equipment, Waste water treatment, Canada.

The facilities of Belleville, Ontario, for water pollution control serve a population of only 30,000. It has a large pumping capacity, however, with 15 pumps transporting sewage to the treatment plant and transferring it within the plant. Three of the four pumping stations are used in bringing sewage to the treatment plant. One of these has a constant-speed sewage pump and a centrifugal pump, both driven by electric motors. Another pumping station contains a constant-speed centrifugal pump, a centrifugal pump with variable speed, and a dual-driven pump, with individual electric motors. The third pumping station transporting sewage to the plant, located at the plant, also has three pumps: a constant-speed centrifugal pump, a variable-speed centrifugal pump, and a third centrifugal sewage pump. The plant itself contains two centrifugal pumps for sludge transfer, with individual motors and a centrifugal pumps for sludge transfer, with individual motor. The digester control building has a water pumping unit and sump pump, and there are two timer-controlled raw sludge pumps in the grit building. (Snyder-FIRL)
W76-08969

MOBILE SEWER CLEANING MACHINE,
C. J. Prange.
Canadian Patent 984,809. Issued March 2, 1976. Patent Office Record, Vol. 104, No. 9, p 55, March, 1976.

Descriptors: *Sewers, *Patent, *Cleaning, Equipment.
Identifiers: *Sewer cleaning machines.

A patent has been granted for a new mobile sewer cleaning machine. The support vehicle has a rearwardly open hose reel compartment. A cleaning hose reel is mounted in the compartment and rotates about a horizontal axis. The reel is fashioned in a drum with a diameter of at least twice the size of its axial width. A hose guide roller is mounted on the support vehicle behind and below the reel compartment and is positioned between the sides of the drum. Thus, during the winding, the hose will coil along the entire width of the drum without additional guidance. (Kramer-FIRL)
W76-08973

ELECTRIC EQUIPMENT FOR MUKOGAWA SEWAGE TREATMENT PLANT, HYOGO PREFECTURE (HYOGOKEN MUKOGAWA SHORIJO NO DENKI SETSUBI),
Hanshin City Improvement Bureau (Japan).
For primary bibliographic entry see Field 5D.
W76-09000

PRESSURE AND FLOW REGULATION DEVICE,
Rain Bird Sprinkler Mfg. Corp., Glendora, Calif. (Assignee).
For primary bibliographic entry see Field 3F.
W76-09049

METHOD AND DEVICE FOR ATTACHING SHUT-OFF CONTROL VALVE TO DISTRIBUTING WATER PIPE SUCH AS SERVICE PIPE WITHOUT STOPPING PASSAGE OF WATER THERETHROUGH,
Yano Giken Co., Ltd. Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 3F.
W76-09050

PRESTON SEWAGE LIFT STATION MEETS FLUCTUATION IN FLOW,
Water and Pollution Control, Vol. 114, No. 3, p 20-21, March, 1976. 2 fig.

Descriptors: *Sewage treatment, *Pumps, *Pipes, *Pipe flow, Pipelines, Waste water treatment, Ozone, Canada.
Identifiers: Sewage lift station, Ontario(Canada).

A new sewage lift station is to be constructed in the Preston, Ontario, area. The residential area plans further development, and flow during the next ten years may vary from one million gpd to 20 million gpd. To provide for the large fluctuation, engineers had to consider pipeline diameters and estimate pump duties. Selected Napier-Reid pumps should meet possible changes from low to high flows in relatively equal stages. When the sewage lift station is in operation, flows will be screened before entering the sump; screenings will be removed by a dumbwaiter to the disposal exit. Air abstracted from the station is to be treated with ozone before discharge. A fresh air inlet is provided, in the direction of the base of the wet well, for the benefit of maintenance operators. (Kramer-FIRL)
W76-09160

HYDRAULIC CALCULATION OF SLUDGE PIPELINES IN WASTE WATER TREATMENT PLANTS (DE HYDRAULISCHE BEREKENING VAN SLIBWATERLEIDINGEN OP RIOOLWATERZUIVERINGSTALLATIES),
F. J. Noz.
Procestechniek, Vol. 30, No. 26, p 871-876, December, 1975. 2 fig, 2 tab, 13 ref.

Descriptors: *Pipelines, *Sludge, Hydraulics, Waste water treatment, Treatment facilities, Equipment, Pipes, Flow rates, *Design criteria, Model studies, *Pipelines.
Identifiers: *Sludge pipelines.

Hydraulic calculation and recommendations for the design of sludge pipelines in waste water treatment plants are presented with special regard to parameters influencing the sludge flow. The formulas proposed by Bingham and Babbitt-Caldwell are discussed. A minimal flow speed of 0.60 m/sec, and optimal speeds between 1.50-2.40 m/sec are recommended for gravity pipelines. The minimal pipe diameter should be 10-15 cm. Gas pockets should be avoided. Pump stations should be provided with centrifugal pumps for primary sludge and for large pipe diameters, or with reciprocating pumps with non-clogging impellers. The suction pipe should have a minimal diameter of 0.15-0.20 m, and the delivery pipe should be at least 0.10-0.20 m in diameter. The suction opening of the pump should be at least 0.60 m below the lowest water level. (Takacs-FIRL)
W76-09208

COMPUTER CONTROL OF SEWAGE AND RAIN WATER PUMPS AT SEWAGE TREATMENT PLANT (GESUISHORIJO NO OSUI, AMAMIZU PONPU NO KEISANKI SEIGYO),
Toshiba Machine Co., Tokyo (Japan). Industrial Apparatus Engineering Dept.
K. Shinnai, M. Machida, and Y. Negoro.
Toshiba Rebyu, (Toshiba Review), Vol. 31, No. 1, p 27-29, January, 1976. 3 fig, 1 tab, 3 ref.

Descriptors: *Sewage treatment, *Pumps, *Rain water, *Sewage, Control systems, Computers, *Automatic control.

A new computer control method for sewage and rain water pumps in a sewage treatment plant is detailed. The sewage and rain water pumps are similar in that pump well level must be controlled. However, sewage is pumped into an activated sludge process facility, while rain water is pumped into receiving waters. A harmonious, rational and simple control method for the two types of pumps is described. (Kramer-FIRL)
W76-09215

COMBINATION RIGS,
Ground Water Age, Vol. 10, No. 8, p 19, 39, 40, April, 1976. 2 fig.

Descriptors: *Drilling equipment, *Rotary drilling, Drilling, Water wells.
Identifiers: *Percussion drilling, *Combination rigs, Lost circulation, High speed drilling.

Combination rigs combine the equipment for both rotary and percussion drilling in one rig. There are numerous advantages to having a combination rig. When the drill operator comes up against a situation such as lost circulation in rotary drilling he can switch to the cable tool method of drilling with the same rig and continue drilling without wasting time and money attempting to seal off the area where the lost circulation occurred. Another advantage of the combination rig is high speed drilling. The operator has the option to use the fastest drilling method for each particular formation encountered. In addition if repairs are required on part of the drilling apparatus, in some cases, the operator can drill with the part of the rig which does not require that equipment. (Gass-NWWA)
W76-09345

PUMPS.
Irrigation Age, Vol. 10, No. 5, p 10, 39-40, 45, February, 1976.

Descriptors: *Pumps, *Pump turbines, *Centrifugal pumps, Irrigation engineering, Irrigation water, Irrigation wells, Irrigation design, Water delivery, Water reuse.
Identifiers: *Irrigation pumps, *Pump specifications, *Pump performance, Pump design, Submersible pumps, Injector pumps.

Pump brands marketed today provide a wide variety of pumps for irrigation. The electric vertical turbine pump is the most popular with centrigual pumps not far behind. Capacities ranging from 0.25 to 75,000 gallons per minute are available. Life capacities and horsepower ratings also vary over a broad spectrum. Specific types of pumps vary from company to company, each having technical innovations developed by that company. (Heiss-NWWA)
W76-09351

IS YOUR PUMP A CANDIDATE FOR INEFFICIENCY.,
For primary bibliographic entry see Field 3F.
W76-09352

WATER FOR THE IVORY COAST.
Ground Water Age, Vol. 10, No. 6, p 26, February, 1976.

Descriptors: *Rotary drilling, Water wells, *Africa.
Identifiers: *Hollow-bore auger, Low cost water well construction, West Africa.

A large-scale drilling program has been initiated throughout several small communities on the Ivory Coast of West Africa. The Acker Drill Company trained local people to operate and maintain equipment. A top drive rotary rig was used to drill pilot wells using augers instead of conventional methods. A custom built hollow-bore auger was rotated to water-bearing sands at a depth of approximately seventy-five feet. A plastic pipe and strainer were installed through the six inch hollow bore. The annulus was filled with gravel around the drop pipe. Clay was used as grouting material to seal against surface run-off contamination. Wells of this nature are popular in this area due to their simplicity, low cost, and rapid installation. (Heiss-NWWA)
W76-09355

8D. Soil Mechanics

FISH TOXICITY OF DISPERSED CLAY DRILLING MUD DEFLOCCULANTS,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
For primary bibliographic entry see Field 5C.
W76-08896

GEOTECHNICAL ASPECTS OF ROCK BORROW FOR LARGE BREAKWATERS,
Dames and Moore, New York.
For primary bibliographic entry see Field 5G.
W76-09386

8E. Rock Mechanics and Geology

FEATURES OF VARIOUS OFFSHORE STRUCTURES,
Raymond Technical Facilities, Inc., New York.
For primary bibliographic entry see Field 8A.
W76-09311

8F. Concrete

WELL COMPLETION - TECHNIQUES AND METHODS,
Dowell Div., Tulsa, Okla.
For primary bibliographic entry see Field 8G.
W76-08894

PENNSYLVANIA SEWER PLACED IN CROWDED DITCH,
Engineering News-Record, Vol. 196, No. 10, p 40, March 4, 1976. 1 tab.

Descriptors: *Sewers, *Construction costs, *Concrete pipes, *Installation, *Interceptor sewers, Pennsylvania, Costs, Rivers, Engineering structures, Pennsylvania.

The contract for installing 3730 linear feet of concrete interceptor sewer pipe along the Little Juniata River, near Altoona, Pennsylvania, has been awarded to Ernest P. Renda, Incorporated. The firm plans to place 48-inch diameter pipe in lengths of up to twenty feet along a 400 foot-wide ditch parallel to the river. The completed line will be within 30 feet of the shore line. At one point of the sewer, a 430 foot-long section will be installed 12 feet under the riverbed for a crossing. The estimated cost of the project is $1,123,000. (Kramer-FIRL)
W76-08965

PIPELAYING 'HORSE' PREASSEMBLES AND HELPS INSTALL OCEAN OUTFALL,
Water and Sewage Works, Vol. 123, No. 2, p 50-51, February, 1976.

Descriptors: *Pipelines, *Installation, *Pipes, *Joints(Connections), *Concrete pipes, California, Sewers, Outfall sewers, Oceans.

A pipelaying horse that can preassemble pipe joints and install the preassembled sections underwater is being used to construct the ocean sewer outfall for Santa Barbara, California. The project involves installing 8,726 ft of reinforced concrete pipe, in lengths of 24 ft. Pieces of pipe are stockpiled on pipe racks onsite to provide backup and ease problems associated with unloading incoming pipe. Construction of the ocean sewer outfall is expected to cost over $4.5 million. Sheeting for the project was manufactured in Europe by the British Steel Corporation. Two types of ballast rock will be used. A crane barge is used with the pipelaying horse. A rock sled is towed along the pipe by the crane for ballasting the pipe. A walking platform is used instead of the crane barge for the portion of the work near shore. The platform will first install a sheetpile cofferdam. It will then lay pipe in the same way as the horse. The walking platform makes it unnecessary to construct a long trestle near the shore. A temporary rail system on top of the sheetpiling will carry pipe and rock near the shore. (Snyder-FIRL)
W76-08970

8G. Materials

STRUCTURAL PERFORMANCE OF BURIED PLASTIC DRAIN TUBING,
Utah State Univ. Logan. Engineering Experiment Station.
R. K. Watkins, O. K. Shupe, and L. S. Willardson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol. 18, No 6, p 1081-1084, 1088, November-December 1975. 6 fig, 5 ref.

Descriptors: Drainage, *Drains, *Drainage practices, *Plastic pipes, Plastics, Backfill, Tubes, Performance, On-site tests, Tests, Pipes.
Identifiers: *Drainage tubing, *Structural performance(Drains).

Structural performance tests of corrugated high density polyethylene plastic drain tubing in soil showed that ring deflection is influenced primarily by settlement of the soil around the tubing and secondarily by bedding. The tubing deflects mostly during the backfilling operation. Excessive ring deflection initiates wall buckling and reversal of curvature. Care in forming bedding and in placing sidefill material reduces ring deflection. Reversal of curvature and wall buckling are not total structural failures but do represent performance limits for the tubing. (Skogerboe-Colorado State)
W76-08771

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN WELL DRILLING OPERATIONS.
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 5G.
W76-08889

TECHNIQUES OF DEEP WELL DRILLING,
Exxon Co., Houston, Tex. Operations Dept.
For primary bibliographic entry see Field 8B.
W76-08890

TECHNIQUES OF SHALLOW WELL DRILLING,
Layne Atlantic Co., Norfolk, Va. Water Resources Div.
For primary bibliographic entry see Field 8B.
W76-08891

SOLUTIONS FOR SOME PROBLEMS RESULTING FROM REFREEZING OF PERMAFROST AROUND A WELLBORE,
Atlantic Richfield Co., Plano, Tex. Production Research Center.
T. K. Perkins, G. R. Wooley, and F. W. Ng.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 39-59, 7 fig, 2 tab, 13 ref.

Descriptors: *Borehole geophysics, *Permafrost, *Well casings, Frozen ground, Oil wells.
Identifiers: *Freezing pressures, Well casing collapse, Thermally insulated casing.

Two potential problems arise from well drilling in arctic regions where permafrost extends deep below the land surface. A thawed area results from circulating drilling mud that becomes heated from the earth below the permafrost. Production of hot oil also causes thawing of the ground surrounding the borehole. The thawed area can reach a radius

of 20 feet or more. If the wells are not produced immediately after completion, or if production is interrupted, the thawed region around the borehole will begin to refreeze. Serious damage to the exterior and interior casing can occur when refreezing of the surrounding ground and liquids within the drill string take place. Field experiments have shown that there are mechanisms available to maintain positive pore pressures in thawing regions around the wellbore. Freezing pressures will rise until excess fluid can be dissipated or until the frozen soil can be pushed back at a rate nearly equal to the rate at which excess volume is being created by the refreezing process. Pressures estimated for normal operating conditions are in a range that can be tolerated if the proper casing is selected. If freezable fluids are removed, the casing interior can be washed and the casing can be filled with gelled oil thereby eliminating freezing problems. (See also W76-08889) (Heiss-NWWA)
W76-08892

DRILLING FLUID PRINCIPLES AND OPERATIONS,
N L Industries, Inc., Houston, Tex. Baroid Div.
J. P. Simpson.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 61-71, 11 tab.

Descriptors: *Drilling fluids, *Wells, Muds, Bentonite, Bactericides.
Identifiers: *Water base muds, *Polymer muds, *Oil base muds, Barite, Diesel oil, Lignite, Lignosulfonate.

Drilling fluids are substances which are introduced into a borehole for a combination of purposes: (1) to transport drill cuttings to the surface; (2) control formation pressures; (3) maintain borehole stability; (4) protect productive formations; (5) protect the bit and drill string from corrosion; and (6) cool and lubricate the bit and drill string. The basic types of drilling fluids are; air or gas, clear water or brine, water muds (clay base and polymer) and oil based muds. Air or gas drilling is used when low formation pressures exist, when strong, competent formations are present, and when no highly permeable formations containing water or oil are found downhole. Clear-water drilling fluid is used with normal or subnormal formation pressures, when no highly permeable formations are encountered and where no extremely water sensitive shale formations exist. Conditions which dictate drilling with oil based muds include: extremely water sensitive shale formations; drilling in deep salt formations; drilling in abnormally pressured formations containing hydrogen sulfide; encountering formation temperatures exceeding 400 degrees fahrenheit; and when productive formations are subject to damage by water. (See also W76-08889) (Heiss-NWWA)
W76-08893

WELL COMPLETION - TECHNIQUES AND METHODS,
Dowell Div., Tulsa, Okla.
F. H. Braunlich.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975. p 73-100, 31 fig.

Descriptors: *Well casings, Cement grouting, Concrete additives, Equipment, Fractures, Wells.
Identifiers: *Well completion methods, *Casing strings, Production casing perforation, Well stimulation, Hydraulic fracturing, Acidizing.

Well completion can be broken down into several basic operations: cementing; perforating; and stimulation of the producing formation. Cementing secures the steel casing pipe as well as protecting and isolating the rock formations drilled through. Additive materials are mixed with the cement to tailor the cement for the specific environment in which it will harden. Float shoes, float collars, centralizers, scratchers and well wiper plugs are all important auxiliary equipment pieces for cementing casing in the well. Perforation of the casing is performed in order to create passages through which oil and gas from the production formation can pass. Perforation is accomplished by exploding bullets, or jet charges in the production casing. Fracturing and acidizing are extensively used for well stimulation. Fracturing is accomplished by pumping a water-base, oil-base or acid-base fluid into the formation at a rate higher than it can accept. The high pressures generated cause parting or cracking of the formation. The other method of stimulation is acidizing, which is done in one of two ways. The acid is injected at a high rate and pressure so as to fracture the formation, or it is injected at a low enough rate and pressure to force the acid into the port structure, thus improving permeability into the borehole. (See also W76-08889) (Heiss-NWWA)
W76-08894

TOXICITY STUDY - DRILLING FLUID CHEMICALS ON AQUATIC LIFE,
Dresser Industries, Inc., Houston, Tex. Oil Field Products Div.
For primary bibliographic entry see Field 5C.
W76-08895

EFFECT OF DRILLING FLUID COMPONENTS MIXTURES ON PLANTS AND SOILS,
Utah State Univ., Logan. Dept. of Soil Chemistry.
For primary bibliographic entry see Field 5C.
W76-08897

THERMAL DEGRADATION OF DRILLING MUD ADDITIVES,
Halliburton Co., Duncan, Okla. Chemical Research and Development Dept.
L. L. Carney, and L. Harris.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 203-217, 2 fig, 8 ref.

Descriptors: *Drilling fluids, *Thermal properties, Stability, Chemical degradation wells.
Identifiers: *Lignosulfonates.

Ninety-eight percent of wells drilled in 1974 had bottom hole temperatures of less than 250 degrees farenheit. Drilling fluids must be designed for temperatures exceeding 250 degrees. The characteristics of drilling fluids are influenced by additives that are organic in nature. High Temperatures cause degradation of the drilling fluid. Reactions are catalyzed or expedited by the increases in temperature and pressure of the drilling environment. The reactions of neutralization and hydrolysis are very important for drilling fluid stability. Selected drilling fluids are grouped in three temperature classes; additives which do not perform above 250 degrees farenheit, additives which do not perform well above 350 degrees farenheit, and additives which are stable above 350 degrees farenheit. These temperature groups exhibit separate temperature stabilities and degradation products. A wide spectrum of analytical tools have been used to gauge the formation of these degradation products in respect to the temperature increases. Lignosulfonate is used as an example of a drilling mud additive. (See also W76-08889) (Heiss-NWWA)
W76-08901

CHEMICAL APPLICATIONS IN OIL AND GAS WELL-DRILLING AND COMPLETION OPERATIONS,
Bartlesville Energy Research Center, Okla.
G. A. Collins.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 231-256, 9 fig, 7 tab, 8 ref.

Descriptors: *Oil wells, *Drilling fluids, *Water pollution, Groundwater corrosion, Brines.
Identifiers: Calcium precipitators, Corrosion inhibitors, Thinning agents, Density controllers, Defoamers, Flocculating agents, Lubricants, Viscosifers, Water-base drilling fluids, Oil-base drilling fluids, Drilling fluid costs, Crude oil.

This is a research study of the affects of chemicals used in oil and gas drilling operations on ground water. Chemicals are used in drilling fluids and well-completion additives to control bacteria, calcium, corrosion, density, dispersion, emulsion, foam, filtrate reduction, flocculation, heavy shale, lost circulation, lubrication, pH, surface activity and viscosity. Some of these drilling fluid and additive constituents, if improperly handled or in the event of an accident, could contaminate ground water. Although contamination of potable ground waters by drilling operations is possible, experience has shown this to be the exception rather then the rule. (See also W76-08889) (Heiss-NWWA)
W76-08903

TOXICITY AND ENVIRONMENTAL PROPERTIES OF CHEMICALS USED IN WELL-DRILLING OPERATIONS,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W76-08906

THE TOXICITY OF DRILLING FLUIDS, THEIR TESTING AND DISPOSAL,
Alberta Energy Resources Conservation Board, Edmonton.
For primary bibliographic entry see Field 5D.
W76-08911

THE HANDLING AND TREATING OF WATER-BASED DRILLING MUDS,
Sun Oil Co., Richardson, Tex. Production Service Lab.
For primary bibliographic entry see Field 5D.
W76-08912

HANDLING AND TREATMENT OF OIL-BASE DRILLING MUDS,
Oil Base Inc., Houston, Tex.
W. C. McMordie.
In: Conference Proceedings on Environmental Aspects of Chemical Use in Well-Drilling Operations, May, 1975, p. 505-509.

Descriptors: *Drilling fluids, Waste disposal, Drilling, Wells.
Identifiers: *Oil-base drilling fluids, Diesel oil, Drilling applications.

Oil-base drilling muds are specially designed fluids used for specific drilling applications, usually in the bottom 2,000 to 3,000 ft. of boreholes. Oil-based muds normally contain diesel oil, inorganic solids, surface active agents, asphalt and water. These specialized fluids are very expensive and account for only 5 to 10 percent of the total mud usage. Handling of oil-based muds requires treatment of both the mud itself and cuttings. The mud is kept in a closed system while drilling and is returned to the mud plant after use. Cuttings are either containerized for shipment to the mud plant, washed or burned to remove the oil coating. (See also W76-08889) (Heiss-NWWA)
W76-08913

FIBERGLASS FIGHTS SO3 ATTACK ON SEWERS,
Water and Sewage Works, Vol. 123, No. 2, p 60-61, February, 1976.

Descriptors: *Sewers, *Construction materials, *Manholes, Plastics, *Corrosion control, Fiberglass, Hydrogen sulfide, Sulfides.
Identifiers: Fiberglass reinforced plastic.

Three types of manhole-wetwell construction are used in Hillsborough County, Florida: reinforced concrete with 20 mil protective coating of coal tar epoxy for both sides; brick with acid-proof mortar; and the more innovative fiberglass reinforced plastic. Fiberglass products, while priced higher than competitive materials, have been designed to last for longer periods. Fiberglass is especially useful in combatting severe hydrogen sulfide corrosion. The Hillsborough County has installed fiberglass products in a residential area sewer project, operating since December 1975. Submersible wetwell units were chosen and contractors reported faster and easier installation for these types of manholes. An important feature of the fiberglass manholes and wetwells was their toughness and strength. Other area projects incorporating fiberglass included the use of manhole liners that are straight sections of 42 inch inner diameter fiberglass-reinforced plastic pipe to repair deteriorated brick manholes. (Kramer-FIRL)
W76-08964

STORM SEWER PIPE JOINTS TIGHT AFTER TEN YEARS,
Domingue, Szabo and Associates, Inc., Lafayette, La.
E. Domingue.
Public Works, Vol. 107, No. 3, p 59, March, 1976.

Descriptors: *Joints(Connections), *Pipes, *Sewers, *Storm runoff, Construction materials, Plastics, Louisiana, Evaluation, Laboratory tests.
Identifiers: Storm sewers.

A systematic testing and evaluation program was instituted by the Louisiana Department of Highways involving materials used for the construction of storm sewer pipes. Selected for inspection in 1973 was a 5700 foot storm sewer system in Lafayette which had been constructed in 1964 and 1965. The sewer pipe had been designed using a preformed, flexible plastic gasket in extruded 'rope' form, packaged between protective paper wrappers, sized in cross section to pipe diameter. The system had been designed to provide a drainage system which would handle runoff and remain watertight for as long as technologically possible. The 1973 inspection included the collection of samples for laboratory testing. The Ram-Nek flexible plastic gasket material in the pipeline was found to show no sign of deterioration, loss of flexibility or loss of adhesion to the concrete joint surfaces after a period of nearly ten years. Thus, it is planned to continue using this method and material for sealing reinforced concrete pipe in future installations. (Kramer-FIRL)
W76-08966

PROBLEM: LOW HEADROOM, SOLUTION: PIPE ARCH,
Water and Sewage Works, Vol. 123, No. 3, p 100, March, 1976. 5 fig.

Descriptors: *Sewers, *Pipelines, *Steel pipes, Construction materials, Storm sewers, Wisconsin.
Identifiers: Corrugated steel pipe arch.

The moving of the Marshfield clinic, (Marshfield, Wisconsin), presented a sewerage problem in that the farmland to which the clinic was moving was flat, contained a small stream and would not be easy to drain. A main line 1,267 foot storm sewer would have a drop of only two feet from an initial four foot depth and would have to carry 72,000 gpm. Since conventional round pipe would have been sticking out of the ground, a corrugated steel pipe arch shape was selected. The storm sewer contains 730 feet of 65 by 40 inch corrugated steel pipe arch; the rest of the sewer is 72 by 44 inch pipe. The soil is sandy stony plastic clay which does not present any corrosion problems. The choice of currugated steel pipe was economical and is considered as the permanent pipe in this location. As of 1975, Marshfield had 162,917 feet of storm sewer, 27,413 feet of which were corrugated steel. (Orr-FIRL)
W76-08968

SEWAGE PIPE FITTING,
A. Tetreault.
Canadian Patent 985,331. Issued March 9, 1976. Patent Office Record, Vol. 104, No. 10, p 10-72, March, 1976.

Descriptors: *Sewage treatment, *Patents, *Pipes, *Pipelines, Equipment, Waste treatment.

A sewage pipe fitting was patented consisting of a main body with a stack inlet at its top and a stack outlet at its bottom and one or more lateral stack inlets, preferably located between ventilating means. A first and a second arm are included in the ventilating means. Both are attached to and communicate with a main branch vent pipe. The ventilating means are provided so that a vent pipe independent of a sewage down pipe is unnecessary. (Synder-FIRL)
W76-08996

COATINGS FOR WASTEWATER TREATMENT PLANTS,
Gilbert Associates, Inc., Reading, Pa.
D. M. Berger.
Public Works, Vol. 107, No. 2, p 68-70, February, 1976.

Descriptors: *Waste water treatment, *Treatment facilities, *Corrosion control, *Corrosion, *Coatings, Coal tar coatings, Zinc, Steel, Concrete plants, Lead, Cleaning.
Identifiers: Coal tar epoxy, Rubber based coatings, Vinyl copolymer solutions.

Water treatment and water pollution control plants must meet corrosion control demands rarely found in other types of construction. The choice of the proper coating should depend on the environment, the substrate being protected, the climate, and attractiveness. They must meet the requirements of an economical service life, reduced maintenance expenditures, and required decorative characteristics. Various materials are discussed. Coal tar epoxy works well on submerged concrete and metal. Zinc-rich primers protect steel in the same way that galvanizing does, can be easily applied, and the treated steel suffers less damage in transport. Vinyl copolymer solutions are most commonly used to provide color to submerged surfaces. Since the lead in lead based paints can react with hydrogen sulfide, chlorinated rubber based coatings are preferred. These types of coatings will also work well in rooms below ground level where moisture is a constant problem. Proper surface preparation is essential since any sort of dirt, moisture or grease can Affect the adhesion of the coating. Steel must be cleaned of all rust, mill scale and surface contaminants. Sandblasting, centrifugal blasting or pickling are recommended procedures. Concrete must be aged at least 28 days under good conditions and should also be cleaned of surface contaminants. Spray application is the most preferred method because of its uniformity. Appropriate measures must be taken in confined spaces to provide fresh air and to avoid explosive solvent vapor air mixtures. (Pinto-FIRL)
W76-09014

SEWER CLEANER FLUSHES OUT ACIDS,
C. Eadens.
Water and Sewage Works, Vol. 123, No. 3, p 65, March, 1976. 2 fig.

Descriptors: *Sewers, *Cleaning, Pieplines, Repairing, Indiana.
Identifiers: High velocity hydraulic sewer cleaning, Television inspection.

A truck-mounted high velocity hydraulic sewer cleaner was used to clean inactive reuse water and acid sewer lines around gun powder production facilities at the Charlestown, Indiana, Army Ammunition Depot. During full-scale powder production at the height of the Vietnam War, these lines had been used as catch-alls for spills and leaks from the acid transmission lines used in the manufacturing. Acid built-up over the years had corroded through the pipes and concrete casings and had begun to penetrate adjacent clay pipe water reuse lines which fed the powder-producing equipment. In addition to removing a 34-year accumulation of dirt, grease, brick and tile, the cleaning had to be 100 percent effective so that the damaged pipe could be efficiently repaired. The 8500 feet of line was cleaned in only 50 working days. Conventional cleaning techniques would have required three or four times as much time, and would have been less efficient. The procedure required the operator to position the street-level sewer cleaning equipment at the manhole downstream with the hose reel above the opening. The high pressure water jets from a special high pressure hose flushed the sewer clean, forcing the debris down the line into the manhole. After the sewer was completely cleaned, a closed circuit television camera was pulled through the sewer, beaming photos of the inside of the line to a video monitor. A chemical grouting packer was used in conjunction with the TV inspection to repair faulty joints and leaks. (Orr-FIRL)
W76-09032

WIRE ROPE,
R. B. McDannald.
Water Well Journal, Vol. 30, No. 4, p. 30-31, April, 1976, 2 tab.

Descriptors: *Drilling equipment, Cost comparisons.
Identifiers: Hemp rope, Manilla rope, *Wire cable, Cable characteristics, *Cable tool drilling, Cable maintenance.

Wire rope is one of the integral parts of any cable-tool drilling operation. Originally, hemp or manilla rope was used. The natural fiber ropes had disadvantages of a short operational life, high internal and external wear, limited spooling capacities and high replacement cost. Wire rope or steel cable became popular when drillers recognized its greater strength, reduced friction, smaller diameter and lower cost. A swiveling rope socket was added to relieve the constant need to turn the rope by hand to achieve a round, straight hole. Today cables are manufactured in various sizes and designs. Cable life still depends on care and preventive maintenance on the job and during storage. (Heiss-NWWA)
W76-09359

FUNDAMENTAL GEOLOGIC PRINCIPLES,
For primary bibliographic entry see Field 7C.
W76-09362

HOW TO GET GOOD SAMPLES BY ROTARY DRILLING,
Virginia Supply and Well Co., Atlanta, Ga.
H. R. Barlitt.
The Johnson Drillers Journal, Vol. 48, No. 1, p. 1-5, January-February, 1976, 5 fig, 1 tab.

Descriptors: *Rotary drilling, *Subsurface investigation, *Sampling, Data collections, Logging, Wells, *Electrical well logging, *Test wells.

Rotary drilling is an economical and fast method of drilling test wells. The advantages of rotary drilling become greater as the depth of drilling increases. The depth to static water level usually cannot be measured in a rotary-drilled test hole without installation of casing and removal of drilling mud. Good samples provide information for proper design of the production well. Accuracy

in test drilling by the rotary method depends on control of the drilling procedure. The best possible formation samples must be obtained. Since the rotary method allows electric logging, the drillers log can be augmented with electric logs. (Heiss-NWWA)
W76-09363

8I. Fisheries Engineering

SELF-REGULATION OF THE POPULATION AND BIOMASS OF SCHOOLS OF YEARLING CARP, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 2I.
W76-08832

ACCLIMATION OF RAINBOW TROUT TO SEA WATER,
Dunstaffnage Marine Research Lab., Oban (Scotland).
For primary bibliographic entry see Field 2L.
W76-09125

FISH HABITAT IN FOREST LANDS,
Pacific Northwest Forest and Range Experiment Station, Corvallis, Oreg. Forestry Sciences Lab.
A. Mills.
In: 'Water Resources Policy Issues - 1975,' seminar conducted by the Water Resources Research Institute, Oregon State Univ., Corvallis, July 1975 (SEMIN WR 020-75), p. 33-38.

Descriptors: *Forest watersheds, *Protection, *Anadromous fish, *Stream fisheries, Pacific Northwest U.S., Economic impact, Lumbering, Forest management, Oregon, Washington, Legislation, Road construction, Land management.

Some problems and progress dealing with protection of anadromous fish habitats in upland forest watersheds, particularly in Oregon and Washington, are delineated. In some of the more productive areas the annual values of sport and commercial fisheries are as high as $270,000 per mile. Development of specialized equipment (skyline yarding, directional tree falling), practices such as buffer strips or streamside management zones, guidelines, policy statements, and other directives initiated internally as a result of new legislation and public pressures are developing better land management practices during lumbering operations where stream courses are involved. The Oregon Forest Practices Act is having considerable impact on timber harvest and related road construction on state and private lands. The Forest Service's 'Streamside Management Unit Guidelines' has issued a new policy statement dealing with fish habitat protection for all National Forest lands in Oregon and Washington. A massive road network in most Northwest watersheds poses serious problems of sedimentation; old roads remain as liabilities during storm events and increasing use. More emphasis must be placed on the protection of small headwater drainages as the quality of a stream system is a function of all its tributaries. (See also W76-09230) (Auen-Wisconsin).
W76-09233

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WOOD PRESERVATIVES: THEIR DEPLETION AS FUNGICIDES AND FATE IN THE ENVIRONMENT,
Canadian Forest Service, Ottawa (Ontario). Eastern Forest Products Lab.
For primary bibliographic entry see Field 05B.
W76-09275

10F. Preparation Of Reviews

THE TIME STABILITY OF DISSOLVED MERCURY IN WATER SAMPLES-I. LITERATURE REVIEW,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 05A.
W76-08767

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

W76-08751	6B	W76-08829	2L	W76-08907	5C	W76-08986	3F
W76-08752	5B	W76-08830	5C	W76-08908	5A	W76-08987	3F
W76-08753	5C	W76-08831	4A	W76-08909	5G	W76-08988	5E
W76-08754	5B	W76-08832	2I	W76-08910	5D	W76-08989	3C
W76-08755	6F	W76-08833	5C	W76-08911	5D	W76-08990	5D
W76-08756	3F	W76-08834	5C	W76-08912	5D	W76-08991	5G
W76-08757	2I	W76-08835	5C	W76-08913	8G	W76-08992	5D
W76-08758	3F	W76-08836	5C	W76-08914	5D	W76-08993	5D
W76-08759	2C	W76-08837	5C	W76-08915	5D	W76-08994	5D
W76-08760	3C	W76-08838	5A	W76-08916	5C	W76-08995	5D
W76-08761	5B	W76-08839	5G	W76-08917	5G	W76-08996	8G
W76-08762	2G	W76-08840	5D	W76-08918	5G	W76-08997	5F
W76-08763	3C	W76-08841	3F	W76-08919	5E	W76-08998	5D
W76-08764	3C	W76-08842	5D	W76-08920	2H	W76-08999	5D
W76-08765	3F	W76-08843	5B	W76-08921	4A	W76-09000	5D
W76-08766	3F	W76-08844	2G	W76-08922	2F	W76-09001	5D
W76-08767	5A	W76-08845	5D	W76-08924	4C	W76-09002	5A
W76-08768	5C	W76-08846	6F	W76-08925	3F	W76-09003	5F
W76-08769	2G	W76-08847	4A	W76-08926	5B	W76-09004	5D
W76-08770	3F	W76-08848	5C	W76-08927	5C	W76-09005	5D
W76-08771	8G	W76-08849	5G	W76-08928	5C	W76-09006	5D
W76-08772	5C	W76-08850	6G	W76-08929	5C	W76-09007	5D
W76-08773	5C	W76-08851	5B	W76-08930	5C	W76-09008	5F
W76-08774	5C	W76-08852	5B	W76-08931	5C	W76-09009	5D
W76-08775	5C	W76-08853	5B	W76-08932	5C	W76-09010	5D
W76-08776	5C	W76-08854	5G	W76-08933	5C	W76-09011	5D
W76-08777	5C	W76-08855	5G	W76-08934	5C	W76-09012	5D
W76-08778	5C	W76-08856	5C	W76-08935	5C	W76-09013	5D
W76-08779	5C	W76-08857	5B	W76-08936	5C	W76-09014	8G
W76-08780	5C	W76-08858	5B	W76-08937	5C	W76-09015	5D
W76-08781	5C	W76-08859	5B	W76-08938	5C	W76-09016	5D
W76-08782	5C	W76-08860	5A	W76-08939	5C	W76-09017	5D
W76-08783	5C	W76-08861	5B	W76-08940	5C	W76-09018	5D
W76-08784	2L	W76-08862	5G	W76-08941	5C	W76-09019	5D
W76-08785	5C	W76-08863	5B	W76-08942	5C	W76-09020	5D
W76-08786	5C	W76-08864	5A	W76-08943	5C	W76-09021	5D
W76-08787	5C	W76-08865	5G	W76-08944	5C	W76-09022	5D
W76-08788	5C	W76-08866	5B	W76-08945	5C	W76-09023	5D
W76-08789	4A	W76-08867	5B	W76-08946	5C	W76-09024	5F
W76-08790	5C	W76-08868	5B	W76-08947	5C	W76-09025	5D
W76-08791	5C	W76-08869	5G	W76-08948	5C	W76-09026	5D
W76-08792	5C	W76-08870	5C	W76-08949	5C	W76-09027	5D
W76-08793	5A	W76-08871	5C	W76-08950	5C	W76-09028	5D
W76-08794	5C	W76-08872	5C	W76-08951	5C	W76-09029	5D
W76-08795	5C	W76-08873	5C	W76-08952	5C	W76-09030	5D
W76-08796	5C	W76-08874	5C	W76-08953	5C	W76-09031	5D
W76-08797	5A	W76-08875	5C	W76-08954	5C	W76-09032	8G
W76-08798	5C	W76-08876	5C	W76-08955	5C	W76-09033	4A
W76-08799	5C	W76-08877	5C	W76-08956	5C	W76-09034	3E
W76-08800	2D	W76-08878	5C	W76-08957	5C	W76-09035	6G
W76-08801	2H	W76-08879	5C	W76-08958	5C	W76-09036	5A
W76-08802	2G	W76-08880	5C	W76-08959	5C	W76-09037	5C
W76-08803	2B	W76-08881	5C	W76-08960	5C	W76-09038	5C
W76-08804	5B	W76-08882	5C	W76-08961	5C	W76-09039	5A
W76-08805	4D	W76-08883	5C	W76-08962	8B	W76-09040	5A
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W76-08809	4A	W76-08887	5G	W76-08966	8G	W76-09044	5D
W76-08810	4A	W76-08888	5C	W76-08967	8B	W76-09045	5D
W76-08811	4A	W76-08889	5G	W76-08968	8G	W76-09046	5D
W76-08812	4A	W76-08890	8B	W76-08969	8C	W76-09047	5D
W76-08813	4A	W76-08891	8B	W76-08970	8F	W76-09048	5G
W76-08814	4A	W76-08892	8G	W76-08971	5D	W76-09049	3F
W76-08815	4A	W76-08893	8G	W76-08972	5D	W76-09050	3F
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W76-08819	4A	W76-08897	5C	W76-08976	5D	W76-09054	5D
W76-08820	4A	W76-08898	2L	W76-08977	5D	W76-09055	5D
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W76-08827	5C	W76-08905	5B	W76-08984	5D	W76-09062	2B
W76-08828	5C	W76-08906	5C	W76-08985	5D	W76-09063	3F

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W76-09067	2B	W76-09146	5A	W76-09225	5A	W76-09304	5G
W76-09068	2F	W76-09147	7C	W76-09226	5C	W76-09305	2E
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W76-09070	4C	W76-09149	4A	W76-09228	4C	W76-09307	6G
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W76-09072	4B	W76-09151	5E	W76-09230	6B	W76-09309	5E
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W76-09082	2G	W76-09161	5D	W76-09240	2L	W76-09319	5C
W76-09083	2I	W76-09162	5D	W76-09241	2L	W76-09320	5C
W76-09084	2L	W76-09163	5F	W76-09242	2L	W76-09321	5C
W76-09085	2I	W76-09164	5E	W76-09243	2J	W76-09322	5C
W76-09086	2H	W76-09165	5D	W76-09244	2H	W76-09323	5C
W76-09087	2I	W76-09166	5D	W76-09245	2F	W76-09324	5C
W76-09088	2I	W76-09167	5D	W76-09246	2A	W76-09325	5C
W76-09089	2I	W76-09168	5D	W76-09247	4D	W76-09326	5C
W76-09090	2I	W76-09169	5D	W76-09248	3F	W76-09327	5C
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W76-09098	4A	W76-09177	5D	W76-09256	2G	W76-09335	5G
W76-09099	2H	W76-09178	5D	W76-09257	2G	W76-09336	5G
W76-09100	2I	W76-09179	5D	W76-09258	2G	W76-09337	3E
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W76-09108	5G	W76-09187	5A	W76-09266	2J	W76-09345	8C
W76-09109	5C	W76-09188	5D	W76-09267	4C	W76-09346	5G
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W76-09111	5C	W76-09190	5A	W76-09269	2B	W76-09348	4B
W76-09112	5C	W76-09191	5A	W76-09270	2L	W76-09349	5A
W76-09113	5C	W76-09192	5A	W76-09271	2G	W76-09350	2L
W76-09114	5C	W76-09193	7B	W76-09272	5B	W76-09351	8C
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W76-09117	4C	W76-09196	5A	W76-09275	5B	W76-09354	4B
W76-09118	5C	W76-09197	5A	W76-09276	5C	W76-09355	8C
W76-09119	5C	W76-09198	5A	W76-09277	5A	W76-09356	5F
W76-09120	5C	W76-09199	5A	W76-09278	5D	W76-09357	5G
W76-09121	5A	W76-09200	5A	W76-09279	5D	W76-09358	2H
W76-09122	5C	W76-09201	5A	W76-09280	5B	W76-09359	8G
W76-09123	5C	W76-09202	5A	W76-09281	5A	W76-09360	5B
W76-09124	5C	W76-09203	5A	W76-09282	5C	W76-09361	2H
W76-09125	2L	W76-09204	5F	W76-09283	5B	W76-09362	7C
W76-09126	5C	W76-09205	5D	W76-09284	5D	W76-09363	8G
W76-09127	5A	W76-09206	5F	W76-09285	5D	W76-09364	5A
W76-09128	5C	W76-09207	5G	W76-09286	5D	W76-09365	5D
W76-09129	2J	W76-09208	8C	W76-09287	5A	W76-09366	5D
W76-09130	5A	W76-09209	5A	W76-09288	5B	W76-09367	5E
W76-09131	7C	W76-09210	5D	W76-09289	5D	W76-09368	2B
W76-09132	7C	W76-09211	5D	W76-09290	5D	W76-09369	5C
W76-09133	4A	W76-09212	5G	W76-09291	8A	W76-09370	5A
W76-09134	5B	W76-09213	5G	W76-09292	5D	W76-09371	5G
W76-09135	7C	W76-09214	5G	W76-09293	5A	W76-09372	5G
W76-09136	2J	W76-09215	8C	W76-09294	5C	W76-09373	5G
W76-09137	5B	W76-09216	5B	W76-09295	5C	W76-09374	5G
W76-09138	4A	W76-09217	5C	W76-09296	5A	W76-09375	5G
W76-09139	4B	W76-09218	5B	W76-09297	5D	W76-09376	5G
W76-09140	7C	W76-09219	5D	W76-09298	5D	W76-09377	5G
W76-09141	7C	W76-09220	5C	W76-09299	5G	W76-09378	5G
W76-09142	5G	W76-09221	5A	W76-09300	5C	W76-09379	5G

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W76-08756 08760--08761 08763--08767 08770--08771 09369--09370	12
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W76-08848--08863 08865--08888 08928--08961	74
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W76-08962--08973 08975--08980 08982--08985 08988, 08990 08992--09032 09044--09045 09151--09192 09194--09223 09364--09367	143
Illinois State Water Survey, Hydrology	W76-08800--08805 09238--09271 09368	41
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W76-09272--09282 09284--09304 09306--09311 09337--09342	44
National Water Well Association, Water Well Construction Technology	W76-08889--08897 08899 08901--08915 08917--08919 09343--09346 09348--09357 09359--09360 09362--09363	46
University of Arizona, Arid Land Water Resources	W76-09062--09075	14
University of North Carolina, Metropolitan Water Resources Planning and Management	W76-08806--08822 09033--09035	20
University of Wisconsin, Eutrophication	W76-08823--08831 08833--08838 09224--09227	19

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE (CONTINUED)		
University of Wisconsin, Water Resources Economics	W76-08839 09228--09237	11
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W76-08751--08755 08840--08847 08920--08927	21
C. OTHER		
BioSciences Information Service	W76-08757--08759 08762 08768--08769 08777, 08784 08832, 08864 08898, 08900 08916, 08974 08981 08986--08987 08989, 08991 09076--09102 09193, 09283 09305, 09347 09358, 09361 09389--09400	64
Biological Consultant and Information Services (Effects of Pollutants on Aquatic Life)	W76-08772--08776 08778--08783 08785--08799 09103--09128	52
Ocean Engineering Information Service (Patents)	W76-09046--09061	16
Ocean Engineering Information Service (Outer Continental Shelf)	W76-09312--09336 09371--09388	43
U. S. Geological Survey	W76-09131--09150	20
Vanderbilt University, Metals Pollution	W76-09036--09043 09129--09130	10

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